Province of British Columbia

Northwest Economic Development Studies

Settlement Options

Ministry of Industry and Small Business Development
THE HONOURABLE DON PHILLIPS, MINISTER

Ministry of Municipal Affairs
THE HONOURABLE WILLIAM RITCHIE, MINISTER

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SETTLEMENT OPTIONS:
A FRAMEWORK FOR DECISIONS

Task Force on North West Economic Development Opportunities

Prepared by:

Municipal Group &
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PREFACE

During late 1981 and early 1982 the Cabinet Committee on Economic Development made a series of fact-finding visits to Northwest British Columbia. In response to briefs presented by a large number of private citizens, corporations and public groups the Cabinet Committee commissioned a report which would summarize the area's economic potential. That report "The Northwest Region, A British Columbia Regional Economic Study" was released on September 15, 1982.

The September 1982 report states that the area north of Highway 16/CNR northline corridor has substantial development potential based mainly upon the significant but largely undeveloped mineral resources. However, this area lacks virtually all of the necessary infrastructure to sustain early large scale development. Lack of transportation and municipal facilities and adequate power at reasonable cost are seen as significant constraints to development at the present time. The report noted that development of minerals and other resources will require substantial private and public investments -- investments which can only be made after careful planning and consideration of alternatives.

In response to the September 1982 report, the Cabinet Committee on Economic Development directed an Inter-Ministry Task Force to begin work on a series of detailed studies on the northern part of the Northwest region (i.e. from Stewart to the Yukon border). These studies were undertaken to determine the scale and timing of potential mineral developments, and to identify options to supply power, transportation and community infrastructure in order to serve those developments. The Task Force was also asked to

identify the social and environmental issues which might arise as development proceeds.

"The Settlement Strategy for the Northwest: A Framework for Decisions" is one of six Inter Ministry Task Force reports plus a summary report which includes the findings of these six background studies. It should be emphasized that these studies do not represent a blueprint for development, but rather indicate priorities for future planning and development. The reports identify options and, as far as possible, the negative and positive factors associated with each option. Final decisions on any specific development options would be premature at this stage. Such decisions will have to await further analysis and more concrete private sector proposals for the development of the resources in the region.

Finally, it should be noted that during the course of these studies the mine development scenarios were refined as more information became available. These scenarios have been updated in the background reports where possible. However, in the power supply report and the transportation report, the analysis is based on the original hypothetical development scenario. The environmental overview report is based upon the early definitions of potential development options provided by the other working groups. The conclusions of these reports are not materially altered by the refined development scenario.

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ACKNOWLEDGEMENTS

The Chairman of the Municipal Group wishes to acknowledge the efforts of each of the members in preparing this report. While the conclusions and recommendations of the final report are very much the responsibility of the Ministry of Municipal Affairs, it was dependent on the efforts of the committee members.

A close working relationship was established with the Environmental and Social Group chaired by Ray Crook. The final reports of this group -- Environmental Overview and Task Force on Northwest Economic Opportunities: Socio-Economic Overview were extensively consulted in preparation of this report. The contributions of this group are gratefully acknowledged.

A close working relationship was also developed with the Transportation Group. A special analytical report on air commuting options was prepared and became an integrated part of the report of the municipal group.

Production support was provided primarily by C. Holding and L. Hodge with S. Seysener. Graphics were prepared by B. Green and J. Gibson.

1.0 INTRODUCTION

1.1 Purpose

The purpose of this report is to provide direction as to the settlement implications of potential mine developments in Northwest British Columbia. The intent is to provide a framework to guide decisions in both the short term and long term.

The first chapter provides the terms of reference for the study. Chapter 2.0 outlines the prospective mine developments and their timing. Chapter 3.0 provides background on provincial settlement objectives and on the analytical framework for settlement options. Chapters 4.0 and 5.0 comprise the major bulk of the report. These analyze the adaptability of existing communities (4.0) and the implications of proposed settlement options (5.0).

The final two chapters are the most critical in the report: in effect they serve as an Executive Summary. Chapter 6.0 outlines a "Framework for Decisions" on settlement of the Northwest and depicts the process of moving towards decisions on particular projects. Chapter 7.0 outlines policy implications for the areas of policy clarification, inter-governmental relations, research for policy development, regional development decisions and regional investigations.

1.2 Background

The report entitled "The Northwest Region: A Regional Economic Study," 1982, (MISBD, 1982b) outlined prospects for economic initiatives in the region and identified issues which would have to be dealt with. Subsequently, a program

of studies was outlined to examine, in more detail, key development prospects and the consequent demands for energy, power, municipal facilities and transportation in the northern portion of the region.

The Northwest Economic Development Opportunities Inter-Ministry Task Force was established to direct the outlined programme of studies. Five sub-groups were established to prepare reports on potential mine developments, transportation, energy, settlements and environmental/social impacts. These sub-groups were coordinated by the Economic/Financial and Marketing Group. Figure one summarizes the organizational arrangements of this task force.

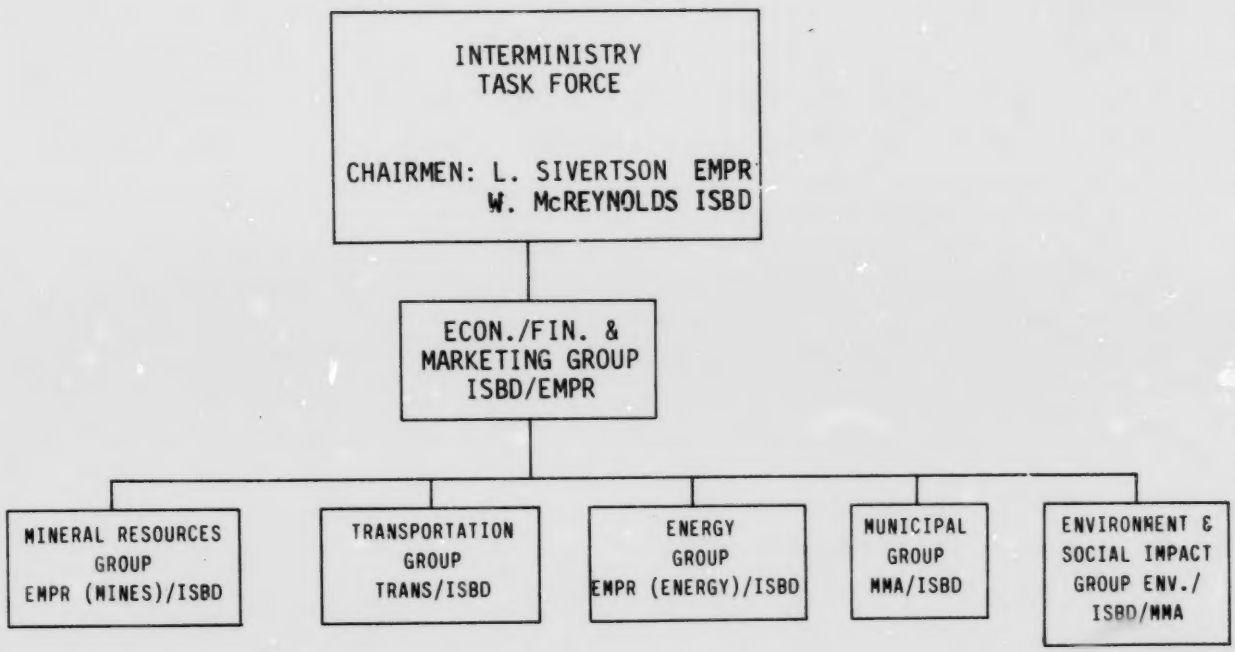
1.3 The Study Area

The area being examined is within the Stikine unincorporated region and the Kitimat-Stikine Regional District. This area is characterized by isolated settlements, small regional population, large proportion of indigenous (native) residents, a resource based economy and a sensitive wilderness environment. Figure two illustrates the current situation in the region.

The study area is divided into a northern zone and a southern zone. The northern zone, north of Stewart, has several small communities located along Highway 37, including Iskut/Eddontenajon, Dease Lake, Telegraph Creek, Cassiar and Good Hope Lake. The northern zone contains all eight possible mine developments.

The southern zone, south of Stewart, in comparison to the northern zone, has a more established and varied settlement

Figure One: Northwest Economic Development Opportunities: Working Structure



pattern focusing on Highway 16. The seven principal communities identified as regional centres for the purpose of this study are Prince Rupert, Kitimat, Terrace, Smithers, Stewart, New Hazelton, and Hazelton.

The primary focus of the report is on the Northern Zone, although some consideration is given to the implications for the Southern Zone.

1.4 The Municipal Group

The Municipal Group was established to analyze the community development implications of the most likely production scenarios for the Northern Zone. The identified objectives of this group, as assigned by the task force, are:

- to estimate the demand for community services and facilities for each project and scenario; and
- to evaluate alternative ways of serving those demands.

The structure and membership of this group is outlined in table one.

1.5 Study Approach

The study group generally utilized the methodology for evaluating settlement options as provided in Resource Community Planning: Framework for Choosing Settlement Options, prepared for the Ministry of Municipal Affairs in 1979.

It is to be understood that, at this stage, the level of analysis is preliminary. Site analysis of the settlement options is minimal. Financial costs of the settlement strategy are estimated at the "order-of-magnitude" level only.

Figure Two

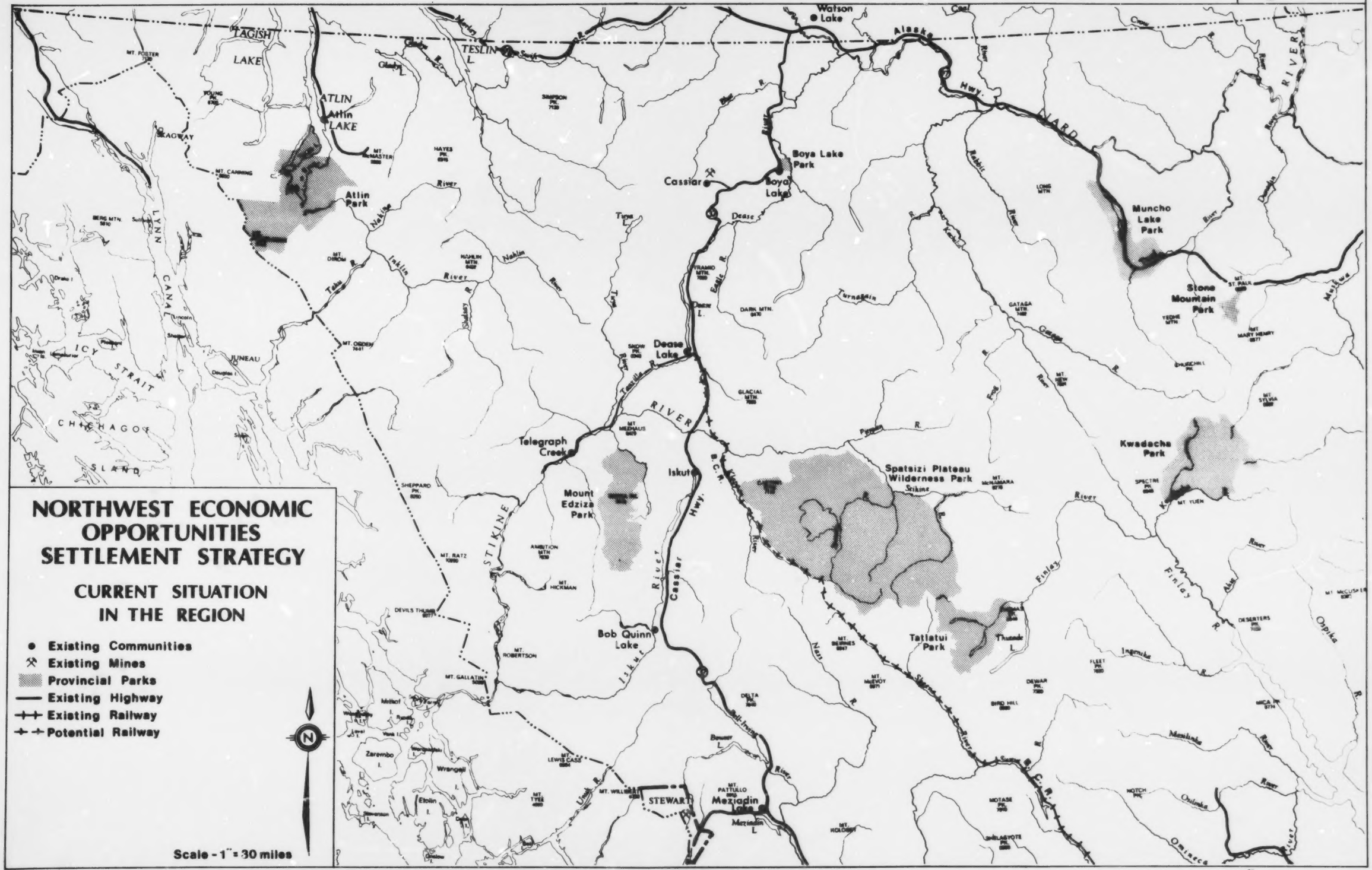

NORTHWEST ECONOMIC OPPORTUNITIES SETTLEMENT STRATEGY
CURRENT SITUATION IN THE REGION
Existing Communities
Existing Mines
Provincial Parks
Existing Highway
Existing Railway
Potential Railway
Scale - 1" = 30 miles
N
Watson Lake
TESLIN L.
TAGISH LAKE
ATLIN LAKE
Atlin
Atlin Park
Cassiar
Boya Lake Park
Boya Lake
Dease Lake
Telegraph Creek
Mount Edziza Park
Iskut
Spatsizi Plateau Wilderness Park
Muncho Lake Park
Stone Mountain Park
Kwadacha Park
Tattatui Park
Bob Quinn Lake
Mezidin Lake
STEWART
JUNEAU
ICY STRAIT
CHICHAGOF
ALASKA
Alaska Hwy.
Cassiar Hwy.
B.C.R.
STIKINE
LYNN CANAL

Table One: Structure and Membership of Municipal Group

1.	K. MacLeod	Executive Director, Policy & Research, Municipal Affairs	Municipal Group Chairman
2.	G. Paget	Policy and Research Branch, Municipal Affairs	Municipal Group
3.	C. Halbert	Policy and Research Branch, Municipal Affairs	Municipal Group
4.	S. Fraser	Industry & Small Business Development	Economic/Financial & Marketing Group
5.	P. Lofthouse	Transportation & Highways	Transportation Group
6.	J. Olmstead	Transportation & Highways	Transportation Group
7.	R. Crook	Energy, Mines & Petroleum Resources	Environment & Social Impact Group
8.	G. Scobie	Industry & Small Business Development	Environment & Social Impact Group
9.	T. Rattenbery	Industry & Small Business Development	Environment & Social Impact Group
10.	B. Carter	Industry & Small Business Development	Environment & Social Impact Group
11.	C. Hawksworth	Planning, Municipal Affairs	Municipal Group
12.	P. Ostergaard	Planning, Municipal Affairs	Municipal Group

The work programme was directed at providing:

- a set of settlement options to meet the development scenarios;
- the service demands associated with each settlement option; and
- management implications of scenarios and the settlement options.

More specifically, the following tasks were isolated.

a. Complete a population analysis using a manpower schedule provided for each development project and for each scenario.

b. Examine the capability of existing communities to accommodate expansion:
   - social;
   - physical;
   - financial; and
   - organizational.

c. Develop a set of settlement options to accommodate the development scenarios:
   - size of workforce;
   - population;
   - distance and transportation mode; and
   - company, worker and public sector preference.

d. Narrow the range of settlement options to the most probable set of options.

e. Estimate costs of settlement options:
   - social costs; and
   - financial costs.

f. Examine organizational/management implications.

g. Provide recommendations of further work to move toward selection of a preferred settlement strategy.

1.6 Limitations

The object of this report is to prepare a framework for settlement development decisions in support of resource development in the Northwest region. It is important to emphasize that this is a planning study directed at preparing the Province and in particular the Ministry of Municipal Affairs to make decisions. While the analysis in the report is based, to a large extent, on a scenario of expected mine developments over the next two decades the intent is not to provide a predictive study or a definitive picture of what is likely to take place in the Northwest. The analysis is directed at placing decision makers in a position to plan for practically any eventuality. This is of particular importance in a resource based regional economy with its attendent uncertainty and volatility. The critical chapters of the report -- Chapter Six "A Framework for Decisions" and Chapter Seven "Conclusions and Recommendations" -- have been designed to accept uncertainty and make it managable through a framework of objectives and policies and a longer term programme of policy development, discussion, research and site investigation.

2.0 DEVELOPMENT SCENARIOS

2.1 Mine Development Scenarios

The timing and extent of mineral development in the Northern Zone of the Northwestern region will determine the demand for municipal services and facilities. The background paper -- "The Northern Region: A British Columbia Regional Economic Study, 1982" (MISBD, 1982b) -- suggested a take-off for mineral development in the later 1980's and early 1990's. Current knowledge regarding relative production costs and ore grades was used to identify a set of most likely mine developments. Table two provides estimates of mine output, employment and longevity.

Development of the Northwest region is highly uncertain and volatile, given the dependence on the resource industry. Nonetheless, a "most likely" development scenario was prepared involving nine potential mines being developed over the next twenty years. Figure three summarizes this scenario, while figure four assigns a probability of development for each of the mines. Figure five outlines the proposed mine developments and possible supporting infrastructure including highways, railroads and small hydro-electric developments. It should be emphasized once again that this report is a planning study and not a predictive study. Hence, emphasis is on determining the implications of and responses to developments rather than definitively determining future events.

2.2 Manpower Demand

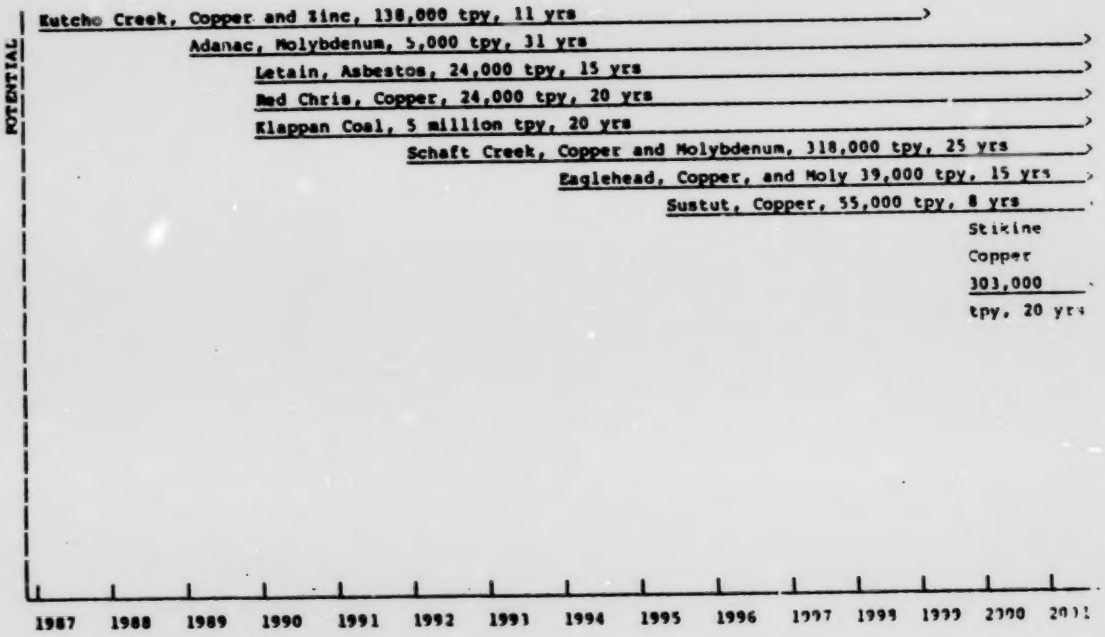
Manpower demand can be divided into construction and operating manpower demand. For the Northwest Economic

Table 2: Northwest Economic Development Opportunities: Potential Mine Developments

Mine	Estimated Mine Life	Estimated Mill capacity (metric tons per day)	Estimated Concentrate Output (tons per year)	Estimated Production Workforce
Kutcho Creek (Cu, Zn, Ag)	11 years	4 300	138 000	450
Klappan Coal	20 years	50 000	5 000 000	1 250
Stikine (Cu, Ag, Au)	20 years	30 000	303 000	450
Schaft Creek (Cu, Mo, Ag, Au)	25 years	100 000	318 000	1 200
Eaglehead (Cu, Mo, Ag, Au)	15 years	10 000	39 000	250
Sustut (Cu)	8 years	6 000	55 000	350
Red Chris (Cu, Au)	20 years	4 500	24 000	375
Adanac (Mo)	31 years	14 000	5 000	320
Letain (Asb)	15 years	2 000	24 000	350

Source: Ministry of Industry and Small Business Development

Figure Three: Possible Production Schedule



Source: Ministry of Industry and Small Business Development

Figure Four: Potential Mines - Probability of Development

Property	Probability of Proceeding Prior to 1990	Probability of Proceeding Prior to 2000
Kutcho Creek	medium	high
Klappan	medium	high
Stikine	low	medium/high
Schaft Creek	low	medium
Eaglehead	low	medium
Sustut	low	low/medium
Red Chris	low	low
Adanac	low	low
Letain	low	low

Source: Ministry of Industry and Small Business Development

Figure Five

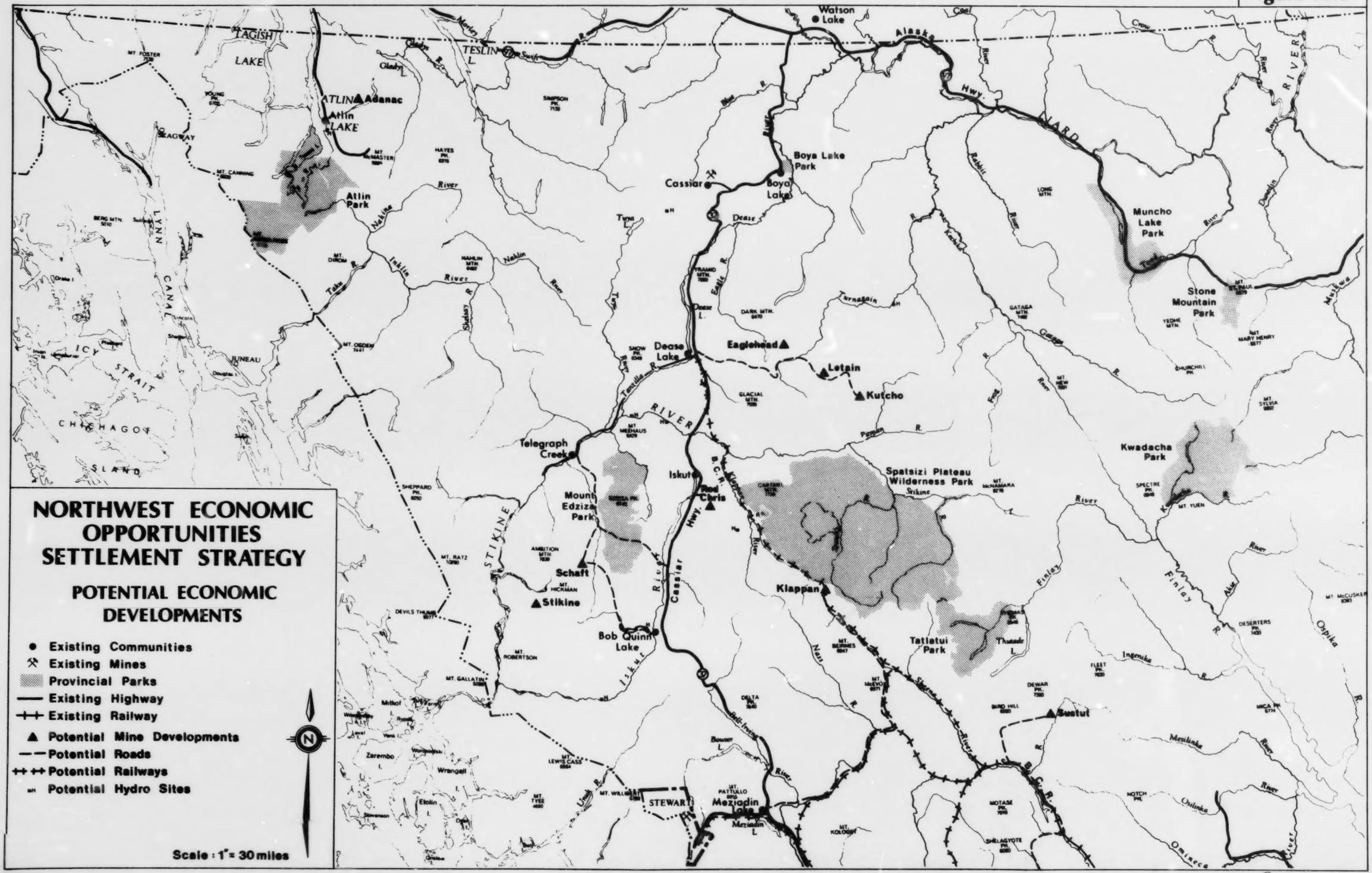

NORTHWEST ECONOMIC OPPORTUNITIES SETTLEMENT STRATEGY
POTENTIAL ECONOMIC DEVELOPMENTS
Existing Communities
Existing Mines
Provincial Parks
Existing Highway
Existing Railway
Potential Mine Developments
Potential Roads
Potential Railways
Potential Hydro Sites
Scale : 1" = 30 miles
TAGISH LAKE
TESLIN L.
Watson Lake
Alaska Hwy.
ATLIN
Atlin
Adanac
Atlin Park
Boya Lake Park
Cassiar
Boya Lake
Dease Lake
Eagle Head
Telegraph Creek
Iskut
Mount Edziza Park
Schaft
Stikine
Bob Quinn Lake
Klappan
Spatsizi Plateau Wilderness Park
Tatlatui Park
Muncho Lake Park
Stone Mountain Park
Kwadacha Park
Sustut
Meziadin Lake
STEWART
JUNEAU
ICY STRAIT
CHICHAGOF ISLAND
LYNN CANAL
Liard River
Stikine River
Cassiar Highway
B.C.R.

Table Three: Northwest Economic Opportunities: Manpower Demand

		1984	1985	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001
Kutcho Creek	construction	360	540	450															
	operating			90	450	450	450	450	450	450	450	450	450	450	450	450	450	450	450
Letain	construction				250	420	350												
	operating						70	350	350	350	350	350	350	350	350	350	350	350	350
Eaglehead	construction									200	300	250							
	operating											50	250	250	250	250	250	250	250
Adanac	construction			340	560	300													
	operating					84	320	320	320	320	320	320	320	320	320	320	320	320	320
Red Chris	construction				300	450	375												
	operating						75	375	375	375	375	375	375	375	375	375	375	375	375
Schaft Creek	construction						960	1440	1200										
	operating								240	1200	1200	1200	1200	1200	1200	1200	1200	1200	1200
Klappan Coal	construction				1000	1500	1250												
	operating						250	1250	1250	1250	1250	1250	1250	1250	1250	1250	1250	1250	1250
Sustut	construction										250	420	350						
	operating												70	350	350	350	350	350	350
Stikine	construction														300	540	450		
	operating																90	450	450

Development Opportunities Study, the potential mines were assumed to have three year construction phase, a one year pre-operating phase in the last year of construction and an operating workforce consistent with full production capacity. The construction, pre-operating and operating workforces for the individual mines are identified in table three.

2.3 Manpower Supply

A comprehensive manpower survey is necessary to determine definitively the extent of a regional labour supply. General conclusions based on preliminary analysis of labour supply within the region are as follows:

- unemployment in the region is high. Assuming 25% of those unemployed could work in the proposed mines, possibly 50% of the initial 1985 mine labour requirement could be met locally. Later years would require proportionally greater numbers;
- the current labour participation rate in the region is not high hence opportunities exist for fuller use of the potential labour force; and
- the typical mine workforce is approximately 70% semi-skilled and 30% highly skilled labour. Given the similarity of skills required between mining, forestry and construction, which are already highly represented in the region, it is probable that a large proportion of the labour demand could be met locally without extensive retraining.

A more comprehensive analysis would confirm the validity of these conclusions.

2.4 Other Regional Development Possibilities

The primary focus of the development strategy is on prospective mine developments and their demand for

infrastructure. However, if an effective settlement stategy is to be achieved, then mining projects should not be considered in isolation of each other or of other economic development prospects in their region. An effort should be made to serve more than one economic development with one community. This has the advantage of increasing the employment base of a community as well as diversifying the economic base resulting in larger, more stable communities hence more attractive communities. Consequently, townsite location should consider development prospects in tourism, forestry and agriculture as well as other mining prospects.

Tourism. The "British Columbia Yellowhead 16 Regional Tourism Plan" (Marshall, Macklin Monaghan, 1980) identified the tourist potential of the region. It suggested four primary tourist nodes: Meziadin Lake, Kinaskan/Tatogga/ Iskut/Eddontenajon, Dease Creek Crossing, and Boya Lake. Dease Lake and Bell Irving Crossing were suggested as secondary tourism service nodes. The principal recreation focii of the region are the wilderness parks, primarily Spatsizi and Edziza.

Forestry. The Ministry of Forests has indicated that there is a significant forest cut in the study area. The indicated (not approved) allowable annual cut for the area along Highway 37 between the Stikine River and Bob Quinn Lake is 100,000 cubic metres. This volume would be sufficient to support one relatively small sawmill providing direct employment on the order of 100 man-years in harvesting and processing. The most appropriate centres for processing would be Dease Lake if the railway is built or Tatogga Lake/Eddontenajon on the highway if it is not.

Agriculture. The Ministry of Agriculture and Food has identified the Stikine Valley from Telegraph Creek southwest to Glenora as an area showing significant agricultural potential. The influence of the area's coastal climate coupled with the long summer days contribute to a growing season ranging from 110 - 120 frost free days. The range of crops experiencing good results include hardy vegetables, fruit trees and vines. adapted forage crops, and cereal crops. Current markets for agricultural produce are found in Dease Lake, Telegraph Creek, and Wrangell Alaska as well as the fishermen on the Stikine River and local guide outfitters using horses.

Other Mining Prospects. The potential for further mining development in the area is an important consideration in the settlement strategy because of the implications for continued mine employment, hence the longevity of the community. The type of resource being mined is an important indicator of other deposits. Metal deposits are more random and sporadic in occurence then coal deposits which generally occur in linear bands. As a consequence, the prospects for longer term viability of coal based communities are better because of the possibilities of expanded production or new mine development in close proximity. Mineralized areas in the Northwest have been identified. Those can serve as a guide to future prospects in base metals.

In conclusion, a number of regional development prospects other than the mines indicated in the development scenarios have been identified. While these prospects are modest in terms of their employment and population implications, they do offer the opportunity for diversifying the economic base of the region.

3.0 DEVELOPING SETTLEMENT OPTIONS

3.1 Settlement Objectives

The Province's 1977 Coal Policy provides perhaps the best statement of provincial intent with respect to the development of settlements in response to large resource projects:

> "In order to provide the levels of public services required by today's society and to provide stability and diversity in community social life, the establishment of single-company and/or single-resource communities associated with coal developments will be avoided where possible. If the significant requirements for a trained, stable workforce alone are to be satisfied, communities must include the level of social amenities and stability which will attract and keep people in coal mining areas. Development of multi-resource communities which may outlive activities associated with coal mining alone will be encouraged and included in the planning of coal developments".
>
> (MEMPR, 1977)

It can be concluded from this statement that the primary objective in selecting settlement options for proposed resource developments is social: the optimum settlement strategy should lead to socially cohesive communities conducive to attracting and retaining a skilled workforce. Clearly, this objective is of mutual interest to the Province, the resource company, the worker and local communities. Previous research has illustrated the correlation between worker satisfaction and industrial productivity, community responsibility, community stability and individual family well-being [Veit, 1978].

A more specific set of "Provincial Resource Community Development Objectives" were developed in the context of the Tumbler Ridge project (MMA, 1981). These are illustrated in figure six. These objectives are more specific expressions of the objectives of social stability and a low level of workforce turnover. Moreover, they are concerned with creating "open communities" free of undue company or governmental influence and, as much as possible, creating normal, equitable financial arrangements between the community, the Province and the company. These objectives are general in nature and apply in varying respects to all communities and regions in the province.

In terms of the Northwest Economic Opportunities Study, the municipal and environment/social impact groups have jointly developed a set of specific objectives which can assist in the planning for settlements in the Northwest region in support of the proposed resource developments. These are:

- Employment Opportunities: to maximize employment opportunities for existing residents of the areas adjacent to mine developments and in the existing regional centres on Highway 16.
- Indigenous People: to minimize negative impacts on the socio-cultural patterns and economic base of Native peoples in the region.
- Community and Labour Force Stability: to maximize labour force and community stability through appropriate settlement planning and economic diversification.
- Social Cohesion: to maintain, repair and develop the social cohesion of communities in the Northwest.
- Regional Centres: to maintain and where necessary develop regional centres capable of providing a wide range of private and public services for regional residents both in the northern and southern zones.
- Environmental Conservation: to minimize disruption to the physical environment with the objective of enhancing as much as possible the environmental values of the Northwest, specifically its wildlife, its fish, its wilderness parks and its cultural heritage.

Figure Six: Provincial Resource Community Development Objectives

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Risk Protection

1. to ensure that costs resulting from full or partial or failure of the enterprise do not accrue to the community or the Province.

Equity Between Communities

2. to ensure equitable treatment of all resource communities in the Province.

Compensation To Communities

3. to ensure that municipalities are adequately compensated if they are adversely impacted by large scale resource development projects.

Equity Between Companies

4. to ensure equitable treatment of resource companies

Self-Governing Communities

5. to achieve self-determining and self-governing communities.

Integrated Housing Market

6. to establish a fully functioning housing market which provides access to affordable housing by all sectors in the community.

Viable and Competitive Commercial Services

7. to develop viable and competitive commercial services.

Level and Timing of Services

8. to ensure that the level and timing of community services are commensurate with community needs.

Safe, Economic & Attractive Physical Environment

9. to ensure a safe, economic and attractive physical environment.

These specific settlement objectives will be utilized throughout the remainder of this study.

3.2 Settlement Options

3.2.1 What Are Settlement Options?

Many decisions must be made by resource companies and governments when planning for the exploitation of natural resources. One key decision concerns the means by which the company's workforce is housed and provided with community services during non-working hours. Integrally related is the decision about how to manage the workers' commute to work. These decisions are important to the resource company. They may affect the cost of the resource venture. More importantly, they may influence, positively or negatively, the productivity of company workers and, in turn, the profitability of the venture. The settlement/commute decision is likewise important to government. Since community living is an important component of social well-being, governments are understandably anxious to make communities as satisfying as possible places to live.

Typically, for new resource developments, settlement options are many and varied. A taxonomy of generic settlement options must include three factors. Industrial workers may be hosted in a new town specially constructed for the resource venture; or they may be hosted by way of an expansion to an existing town. The workers' settlement may be located in or out of the resource region. Finally, the workers' commute from the host community may be sponsored, that is organized and subsidized, by the company; or it may

Taxonomy of generic settlement options.

Type of commute \ Type of Town	Extra-regional		Intra-regional	
	New Town	Existing Town	New Town	Existing Town
Sponsored Commute	--	**	*	**
Unsponsored Commute	--	*	**	**

Key: 1) "--" denotes extremely improbable.
2) "**" denotes possible but improbable.
3) "***" denotes eminently possible.

be unsponsored. As shown above, this three-way taxonomy of settlement options yields eight conceptually valid options. Of these, however, two options are unlikely ever to be selected and a further two are improbable. Realistically, there are a total of four generic options that make good sense. These are:

- sponsored, extra-regional commute from an existing town;
- sponsored, intra-regional commute from an existing town;
- unsponsored, intra-regional commute from an existing town; and
- unsponsored, intra-regional commute from a new town.

Of course a settlement option for any particular venture may consist of any combination of the above.

3.2.2 What are Preferred Settlement Options?

Settlement options are one thing; preferred settlement options are another. It is one matter to specify conceptually valid settlement options for any particular resource venture. A more fundamental task, however, is to

examine settlement options rigorously and critically and to specify preferences. This whole process of developing and analysing settlement options and, most importantly, selecting a preferred settlement option is documented in a 1979 Ministry of Municipal Affairs publication entitled "Resource Community Planning: Framework for Choosing Settlement Options."

A number of actors may hold and express particular viewpoints on the settlement issue. The resource company proposing a venture naturally is keenly interested in the question. The company would be interested in the effects of different settlement options on its balance sheet and cash flow situation. It will likely prefer options which do not turn up as a liability and do not significantly affect cash flow. At the same time, the resource company must be concerned with labour attraction, labour turnover and worker productivity. These are variables which are partly a function of worker satisfaction with the overall quality of community life [Veit, 1978]. The company can influence the overall quality of community life of the worker directly by providing facilities and services or indirectly by providing commuting subsidies to enable workers to reside in established communities. These types of activities, however, represent a financial cost to the company. Hence resource companies sometimes must make trade-offs between minimizing balance sheet effects and maximizing worker satisfaction.

Productivity is an important determinant of a resource company's settlement preference. Since it is the worker who is more or less productive, there also must exist some relationship between productivity and the worker's settlement preference. The worker's preference may or may

not be in accord with the company's preference. The settlement preference of the worker is likely to be most affected by factors such as distance of the commute to work, amenities of the host community, housing quality and availability, and so forth [MMA, 1980].

Governments may also have settlement preferences; these preferences, too, may not agree with corporate preferences. Local governments which are a possible host to incoming industrial workers may or may not wish to expand to accommodate new residents. A number of factors are likely to determine a community's willingness to expand. If expansion is perceived to increase the level of local services, bring economic diversification and generally increase resident satisfaction, then expansion would likely be welcomed. Conversely, if expansion is perceived as being disruptive of social cohesion, then expansion would likely be resisted.

The provincial government, too, may articulate a settlement preference. The provincial government's concerns generally revolve around the issues of local government policy, housing policy, small business development, provincial administrative efficiency, and provincial service coordination. Although any settlement option for a particular resource development may be able to achieve provincial objectives in time, different options may do so at different rates, with different public costs and with a different level of social welfare. Therefore the way in which these objectives are achieved is important.

3.2.3 The Approach of this Study

Settlement preferences cannot be determined in the

abstract. Choosing a settlement option is a process of balancing the often conflicting viewpoints of several actors. Only when the viewpoints of all actors are clearly enunciated can a settlement choice finally be made. In fact, settlement choices in connection with large scale resource developments are usually the outcome of intensive study and negotiation.

The present study, however, does not have the luxury of dealing with concrete development proposals and known actors. Therefore, a definitive statement of preferred settlement options for prospective developments in the Northwest cannot be made. Instead, this study merely attempts to identify and, to the extent possible, rank several reasonable settlement options for each mine or mine grouping. Ordinal ranking only is attempted. The final product of this study is, in effect, a framework for making settlement choices in the future when development is closer at hand.

The analytical sequence for this study can be succinctly stated. The first task is to specify criteria for developing settlement options: the object here simply is to provide some means of separating conceivable options from inconceivable options. Given these criteria, the second task consists of developing a reasonable range of settlement options, that is all options which cannot be rejected on *a priori* grounds. The third step consists of analysing all reasonable settlement options and developing knowledge about their likely implications in terms of population in-migration, environmental effects, social consequences and fiscal impacts. Ranking options takes place next. This is done on an ordinal basis in the sense that no firm cost/benefit analysis is undertaken. The ranking process

attempts only to establish which options are best but does not specify by how much. The final step is to put forward a framework for future decisions. The framework is in five parts: policy conclusions; requirements for further policy study; issues for inter-governmental resolution; regional development decisions; and requirements for regional, on-site investigation.

3.3 Criteria for Developing Settlement Options

In this section, criteria for developing reasonable settlement options for the Northwest region are presented. The criteria are not simple. Nor do they direct one uniformly toward any particular settlement option. On the contrary, the criteria are complex and coexist always in tension. In concept, an infinite number of settlement options can be described through a process of trading-off or sacrificing one criterion for another. But, realistically, only so much sacrifice is reasonable. The purpose of presenting these criteria for developing settlement options is to provide a means for dismissing unreasonable settlement options at the outset. This section discusses five criteria and shows how they interrelate.

3.3.1 Existing Settlements

Existing settlements often hold considerable attraction as a settlement option for a particular venture. Various actors may, however, be attracted by existing settlements for different reasons. Resource companies may see several merits in being hosted by an existing town. Existing towns, compared to new towns, may more readily satisfy the social and service needs of the company's workforce and, in turn, increase worker productivity. Moreover, the larger the

town, the more likely that long distance commuting will be seen to be viable and the less likely the workforce size will be seen to be a constraint on commuting. This criterion is integrally related to the criteria of distance and workforce size. Other advantages offered by existing communities include the possible existence of excess capacity in community services and the potential for tapping excess or underemployed labour already resident in the community.

For workers, existing towns may be perceived to be more aesthetically attractive and have higher levels of social, professional, recreational, educational and cultural services than a new town. These influences are relatively intangible but are important in establishing settlement preferences for expanded communities both for a resident labour force and an in-migrant labour force. On the other hand, an existing town may not have these desirable characteristics and workers may consequently express a preference for a new town. Furthermore, new town housing may be newer and of superior quality to existing town housing, reinforcing the worker preference for new towns.

Governments also may have a preference for existing towns over new towns. The existing town itself may perceive considerable benefit from expansion: service levels may rise, economic diversification may ensue and costly excess capacity may be reduced. Of course, existing towns might also be placed under considerable pressure by expansion. For example, service capacity might be deficient and expansion could prove to be very costly. Moreover expansion might disrupt the social cohesion of the town. Under certain circumstances, existing towns could prefer the no-growth option.

3.3.2 Distance

Distance is an important factor in the selection of settlement options. Distance is a multi-dimensional variable. It can mean distance from services or distance from work. It can be actual distance or perceived distance. The perception of distance, moreover, varies between the company, the employee and the residents of a resource community.

From the perspective of community residents, distance is usually perceived of as isolation from social, recreational, cultural, professional, governmental and commercial facilities and contacts. Residents with children will generally perceive distance differently than residents without children due to differing service needs. Some types of isolation can be overcome. For instance, the provision of high quality, satellite communication can reduce the sense of remoteness and blandness in resource community life. On the other hand, it is difficult to overcome remoteness from commercial facilities. Satellites can bring culture to people but not (yet) microwave ovens.

Workers in the guise of community residents may wish to live close to large, established centres. Yet workers in the guise of company employees may prefer to live close to their workplace to reduce the length of the commute. A settlement option must balance community isolation and the length of the workers' commute. Resource companies tend to be keenly interested in this issue. The longer the required commute, the more likely the company will have to sponsor, that is organize and subsidize, the commute. Long distance commuting can be costly: taxing on the worker and expensive for the company. Yet workers must be satisfied in both

their lives. They must be satisfied as commuters and as community residents. Resident satisfaction may dictate the need for a sponsored commute.

Commutable distance cannot be defined with any precision. It is a variable which is in part a function of where the commute is from. Longer commuting is viable from more attractive communities. The less attractive a host community, the less likely workers will tolerate the aggravation of long distance commuting and the more attractive new town options will appear. Commutable distance is also a function of the size of workforce and the nature of the resource project. Sponsored commuting opens up many settlement options which might not otherwise be available. For instance, where a resource venture is reasonably small and flexible or unusual shift scheduling arrangements are possible, organized commuting over great distances is possible. One mine in the North West Territories is known to be served by an air commute from Montreal.

3.3.3 Size of Workforce

The size of the workforce will determine the size of a new town or partly determine the degree to which an existing town will have to be expanded (excess capacity of an existing town is another determinant). The larger the size of the workforce to be employed by a resource venture, the greater the potential size and quality of a new community. Larger towns can provide a wider range of services and greater social opportunities. Conversely, smaller workforces mean smaller communities which are typically more expensive per employee and are more limited in terms of

livability. Thus the comparison of existing town and new town settlement options will be affected by the size of workforce criterion.

Resource companies may be especially sensitive to the size of workforce criterion in situations where they must sponsor a commute. Problems with commuting may increase exponentially with the size of workforce. Logistical problems, transportation problems, union problems and travel time compensation problems are all likely to worsen dramatically as the size of workforce increases. Workers may be less sensitive to this criterion. As the size of workforce increases, the divergence between company and worker preferences may widen.

3.3.4 Nature of the Resource Development

The nature of the resource development project is an important consideration in the selection of a settlement option. Two factors of note are the longevity of operation and the type of mine.

The longevity of the mine operation determines the length of time the mine employees will require housing and related community services. From a public sector perspective, the longer the life span of the mine, the greater the social and financial viability of a new or expanded community. The shorter the life span of the mine, the less likely a permanent settlement option will be considered and the more feasible will be a temporary settlement or camp option. A mine with less than twenty years of mineral reserves can be considered short term, hence are more desirably served by temporary settlement options. If permanent options are contemplated, such as new communities or expanded

communities, then consideration has to be given to the implications of eventual decline.

The type of mine determines the kinds of work schedules that will be developed, considering employee safety, health and productivity. For example, underground mines have restricted working hours hence their work schedules are limited to shorter work days and weeks than work schedules for open pit mines. Consequently, underground mines are less adaptable to commuting schemes involving extended working hours and weeks, hence are more likely to be served by new or expanded communities.

3.3.5 Opportunities for further resource development

Exploitation of other resources can strengthen the case for a particular settlement option by increasing the longevity of the proposed community or by increasing the size of the proposed community's population, hence the variety and the quality of the service and economic base. In addition, it would be to the advantage of the province to support some settlement options which potentially could provide a stimulus for further resource development through the provision of the infrastructure for access and housing. Thus acceptable or marginally acceptable settlement options can become more acceptable when opportunities for further resource development exist.

3.4 Conclusions

It has been the intent of this chapter to outline the complexity of the process of choosing settlement options. It can be concluded that settlement option decisions are

complex and multi-dimensional. Many factors are involved -- community characteristics, distance, workforce size -- and each works in different directions. There is no simple method, checklist or mathematical formula that can lead to an easy decision. The framework however provides a process leading to discussion, negotiations and decisions.

4.0 EXISTING COMMUNITIES IN THE REGION AND THEIR ADAPTABILITY TO CHANGE

4.1 Introduction

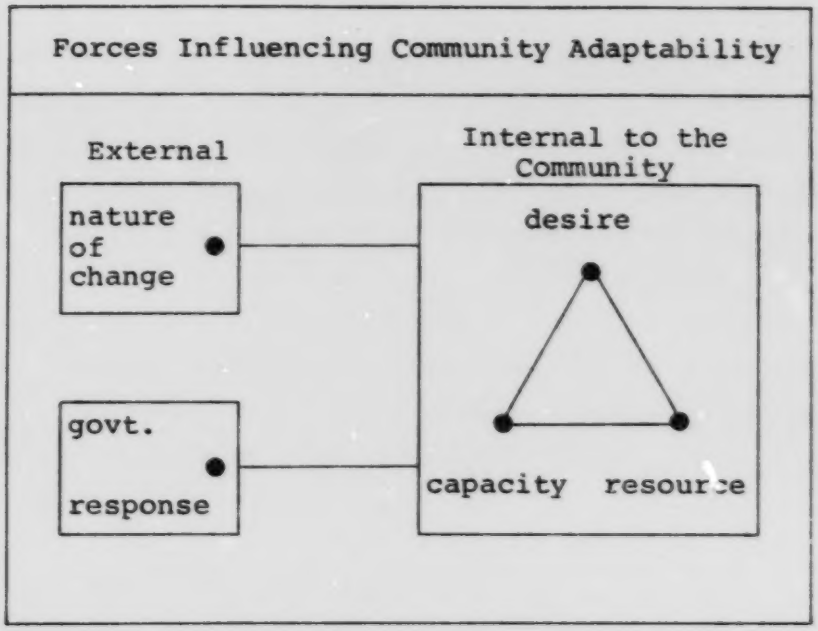
Development of a settlement strategy for the Northwest starts with the existing communities in the region. Regional economic development presents both social opportunities and social costs for existing communities. It is important therefore to examine a community's adaptability to radical change resulting from economic development. Adaptability refers to a community's ability to manage significant change with minimum of social disruption. Community adaptability is a function of five factors:

- Desirability: The community's perception of whether radical social change will bring benefits to the community as a whole and whether it is willing to accept costs in order to achieve benefits.
- Community Resources: The level and extent of tools that the community has at its disposal to manage radical change: to channel, direct, exploit and dampen change by utilizing social networks and organizations, community services, service professionals and political leaders.
- Community Capacity: The extent to which the community is able to translate its perceptions of desirability into positive actions and bring resources to bear in managing change.
- Nature of the Change: The impact the community experiences due to the size, duration and characteristics of proposals and actions of the agent of change such as a company or government.
- Government Policy Responses: The extent to which senior government intervenes to change perceptions, increase resources, regulate agents of change or increase the capacity of the community to manage change.

The relationships between these factors are illustrated in figure seven.

It should be emphasized that a most critical component of community adaptability is the presence of local government.

Figure Seven: Forces Influencing Community Adaptability



Social Problems Influencing the Forces of Adaptability

- leadership/social networks
- level of resident satisfaction
- level and timing of services
- diversified economy: employ stab.
- lack of commercial development
- stage of growth
- historical continuity
- level of social cohesion

It constitutes a means for expressing community desires; it provides a principal means for the community to deal effectively with change. A good measure of adaptability then is the presence and capability of local government.

The first three of these factors -- perceptions of desirability of change, resources to manage change and capacity to manage change -- are internal to the community. The latter two factors -- policies of the agent of change and of government -- are external to the community but can alter the internal factors. Every community has a unique combination of historical, institutional, attitudinal and demographic characteristics that will affect the balance between the internal forces and influence the degree of community adaptability to radical change [MMA, 1979a; MMA, 1979c].

The following two sections examine the adaptability of existing communities in the northern zone (section 4.2) and existing regional centres in the southern zone (section 4.3).

4.2 Existing Communities in the Northern Zone

A background paper, "The Adaptability of Existing Communities in the Northern Zone", was prepared for this report. A summary of the evaluation on a community by community basis is provided in this section. Each evaluation examines, in turn, community resources, community desires and capability for expansion.

4.2.1 Cassiar

Cassiar, located 146 km south of Watson Lake (Yukon) and 122 km north of Dease Lake, with a population of approximately

1500, is an unincorporated "company town" constructed, financed and operated by Cassiar Asbestos Corporation, a division of Brinco Mining Ltd. The community is totally dependent on the asbestos mine which has estimated reserves of between 6 and 20 years. Cassiar residents receive the highest level of services in the northern zone although company ownership of the services restricts their use.

Cassiar Asbestos has argued for incorporation of Cassiar in order to reduce its financial and administrative costs, lessen perceived paternalism, and facilitate private home ownership. Local residents have a strong sense of community pride/identity and a concern for the community's future. Diversification and expansion would be welcomed, however residents are concerned with the financial implications of incorporation. The Ministry of Municipal Affairs has been engaged in discussions with the company on this issue. It has been indicated to them that resolution requires careful consideration of the following: suitability of the site for continued expansion; the possibilities of it becoming a regional centre to serve other resource developments; the longevity of the resource; the financial costs and appropriate sharing of costs; and, last but not least, the wishes of local residents.

Although the site is not ideal in climate or aspect there do not appear to be significant physical constraints to development. More importantly, however, Cassiar is not well situated to serve as a residential base for the potential base metal and coal mines. Still, it can and does serve as a residential base for a number of precious metal deposits. The "one company" nature of the town makes it difficult to utilize it as a base for long range, block time commuting.

However, one possible future for Cassiar is provided by the Letain deposits, also controlled by Brinco, 120 km southeast. A block time commuting program utilizing the established townsite and its experienced workforce may be feasible.

Cassiar, in summary, cannot directly participate in potential developments due to its location. Furthermore, the company town nature of the community is a serious impediment to economic and social diversification. Without resolution of the issue of incorporation the best prospects for the community are its continued focus on asbestos mining and the possibilities for long range, block time commuting, particularly to the Letain deposit. Regardless of the development scenarios, the issue of local government for Cassiar needs comprehensive evaluation.

4.2.2 Dease Lake

Dease Lake is a small (population 237, 1981 Census), unincorporated hamlet located 256 km south of Watson Lake. The community has a strategic location on Highway 37 and is currently the staging point for mine developments to the east, south-east and south-west. Furthermore, it is the potential terminus of the B.C.R. The community is a significant service centre with R.C.M.P., a high quality airport, government building, health clinic and school. It is expected that existing residents would welcome new mine developments as a source of employment and expansion of business.

The major difficulty with Dease Lake is its distance from the potential mine developments. By road, Letain is 92 km (57 miles), Eaglehead is 84 km (52 miles), and Kutcho is 128

km (80 miles) from Dease Lake. These distances are beyond normal daily driving distance in northern climates. From this point alone Dease Lake does not appear to be a feasible staging point for daily commuting. Furthermore, the site itself has problems: lack of superior site amenities, the variability and complexity of the site geomorphology and consequent uncertainty of building conditions. Existing services have little or no excess capacity. Without the proposed mine developments, its location on highway 37, its airport and its core of public services means that it will benefit from the overall development of the region. The airport is particularly promising because it facilitates air commuting schemes. If the B.C.R. extension were to be developed then Dease Lake's role would be further enhanced.

In summary, Dease Lake is not well situated to serve as a daily commuting base for the potential mine projects. However, it will likely maintain and expand its regional support role. Existing residents of Dease Lake should be provided the opportunity to participate in development. Dease Lake should be considered as a staging base for long range, block time commuting strategies. Regardless of whether the proposed developments take place or not, efforts should continue to be concentrated on improving Dease Lake's role as a service centre and staging point for regional resource development.

4.2.3 Telegraph Creek

A small (population 270, 1981 Census), unincorporated settlement, Telegraph Creek is the home of the majority of the Tahltan Indian Band population, the largest group in the community. It is extremely isolated with a low level of services but great historical significance.

The native community is not opposed to economic development but is concerned with an influx of people and the effects on their communty and its outstanding land claim. Radical economic or social transformation of the area would be resisted.

A number of factors constrain development:

- rugged topography, flood hazard and poor slope stability that are characteristic of the area;
- good quality agricultural land that surrounds the community;
- the isolated and difficult-to-access location;
- the poor location vis-vis potential mine developments; and
- the social implications of radical expansion.

These factors make Telegraph Creek an unpromising staging point for the Northwest development.

Telegraph Creek, in summary, is not well situated to serve as a primary base for the potential mine developments. Furthermore, there are strong social and physical reasons why it should not be expanded. Residents should, however, be given the opportunity to participate in proposed developments through a regional block time commuting scheme.

4.2.4 Iskut/Eddontenajon

These settlements are located 1500 metres (one mile) apart on the east side of Highway 37, 85 km (53 miles) south of Dease Lake and 440 km (270 miles) north of Kitwanga on Highway 16. Iskut is settled by approximately 200 Tahltan Indians of the Iskut Band while about 50 white residents live at and around Eddontenajon, a small highway and tourism service centre.

The native community is concerned with a number of issues: Tahltan land claims; the size of the Iskut Reserve; Crown

land trespassers; and the alienation of land, particularly in the area of proposed Reserve expansion. As with Telegraph Creek, expanded employment opportunities for area residents would likely be welcomed provided the jobs do not bring radical community change.

The Iskut-Eddontenajon area is physically appropriate for expanded settlement. The area's attractiveness has been recognized by the B.C. Hinterland Highway Service Nodes Study, in which the corridor south to Natadesleen Lake is rated as high for potential development of primary service nodes. In general, elevations are low, solar aspect is favourable, and the ground conditions appear favourable for buildings.

While the Eddontenajon-Kinaskan Lakes corridor may be an appropriate area for new residential development, the physical expansion of Iskut or Eddontenajon is unlikely to be the most desirable option within the corridor. Levels of public services and investment are low and most services are not capable of meeting significantly expanded demands without being upgraded. Selection of these communities as the base for serving potential mine developments would in scale and complexity constitute a new town. The major concern with respect to expansion is social. Radical expansion is not considered desirable because of its impact on Native peoples.

In summary, Iskut and Eddontenajon are not suitable communities for expansion even for the Red Chris mine because of the implications for Native peoples. The residents of these communities should be offered the opportunity to participate in development through involvement in block time, long range commuting schemes.

4.2.5 Good Hope Lake

The hamlet of Good Hope Lake is located 30 km (19 miles) east of the Cassiar Road/Highway 37 junction and has a population of 125 people, most of them Native, no local government, limited public services and no private services. The community is poorly situated with respect to potential developments and, although the physical conditions for expansion are good, the community is very weak in terms of its capability to accommodate radical change. Expansion is therefore not considered desirable. A comprehensive community development effort would be necessary to determine the wishes of the residents with respect to future development.

4.2.6 Evaluation of Community Adaptability

The attached table four summarizes the adaptability of existing northern communities to radical expansion. It focuses on three dimensions: existing community resources, the wishes of local residents and the capability of the communities to expand. The principal points are examined in this section.

Community Resources. With the possible exception of Cassiar, communities in the region have low levels of resources. Populations are small, the level of services is low, local government structures are absent and employment opportunities are minimal.

Community Desires. The wishes of local residents are not well known. However, preliminary analysis indicates a wide variety of opinions ranging from desire for growth, concern about growth and resistence to growth. A major feature of this is a fundamental dichotomy between native and white

attitudes. It is expected that change would be accepted if it provides opportunities, is well managed and involves residents in decisions.

Capability for expansion. Existing communities are not well situated to serve as residential bases for daily commuting. Furthermore, while there appear to be no insurmountable physical constraints to expansion, the social infrastructure is weak. The social costs of radical expansion could be serious. At the same time there is a necessity to include the existing underemployed labour force of the community in the potential economic development of the region.

Existing communities, in conclusion, appear to have a low level of adaptability.

4.2.7 Strategy for Development and Implications

The proposed settlement strategy for existing communities has both a short and a long term focus. In the longer term the emphasis should be on providing residents of existing communities with opportunities to participate in development should they choose. Given their location in relation to the potential mine developments it is more likely that this objective would be met through:

- block time as opposed to daily commuting; and
- further development of their secondary service role as opposed to radical expansion to make them the prime focus for mine employees.

In the short term the emphasis should be on developing the capabilities of the local community to deal effectively with change. The intent is not to prepare them to accept growth but to ensure that they can choose their future direction. The development of local government institutions is one

Table Four: Evaluation of Community Adaptability: Existing Communities in the Northern Zone

	EXISTING COMMUNITY RESOURCES	COMMUNITY DESIRES	CAPABILITY FOR EXPANSION
CASSIAR	A company town owned by Cassiar Asbestos (Brinco). With population of 1500, it is the largest and best serviced community in the Northern Zone. Its future is highly dependent on the asbestos market and status of reserves.	Community wishes incorporation but with a fair sharing of costs and protection from closure. Expansion & diversification of the town is desired.	The community is not well situated to capitalize on prospective resource developments. The "company town" is a further constraint on expansion. Physical constraints are not serious, however, the town is not optimally sited for livability concerns. The community itself is well developed in terms of services, facilities and overall community livability.
GOOD HOPE LAKE	A small community of Native people with a population of 125. The service level is extremely low. Unemployment is high.	unknown	Physical conditions for expansion are good, however, the capability to manage radical change is weak.
DEASE LAKE	Dease Lake is unincorporated with 200 persons of non-native status. It occupies a strategic location in relation to the proposed B.C.R. extension, Highway 37 and access routes to the Telegraph Creek and Tumagain mine areas. The airport, government building and R.C.M.P. detachment are important features. Unemployment is high.	The community welcomes growth and development and appears anxious to participate in proposed developments.	Dease Lake is well located to serve as a service centre for potential developments but not on a daily commuting basis. Physical expansion capability is good, but there are constraints in terms of variability of terrain. Physical services are poorly developed and local government is rudimentary. Radical expansion would, in effect, constitute a new town.
TELEGRAPH CREEK	An unincorporated settlement of approximately 300 persons with the majority native people and most living on the Tahltan reserve. The community is remote and difficult to access. The service is low. Unemployment is high.	The community appears strongly opposed to any development which would result in significant change to the community or the physical environment. The Tahltan band is actively pursuing a land claim and are opposed to developments which may interfere with that process.	The community is not well situated to serve potential mine developments on a daily basis. The community may moreover resist radical change. The physical prospects for expansion are limited by terrain. Radical expansion would be extremely distruptive and in effect would constitute a new town.
ISKUT/EDDONTENAJON	Iskut is a small (200) native community while Eddontenajon (50) is largely non-native. Neither has a broad service or economic base. The areas have been identified as a service node in the Regional Tourism Strategy.	The native community would not be positively disposed to development as long as outstanding grievances remain unresolved.	Service capacity to expand is not available, however land supply appears to be good. Expansion is not desirable from a social perspective.

means to that end and is discussed in section 7.1. In addition a number of persistent community development problems, such as inadequacies of local government structure (Cassiar), Crown land allocation (Telegraph Creek, Cassiar, and Iskut/Eddontenajon) and native land claims, need to be resolved.

4.3 Existing Regional Centres in the Southern Zone

This section performs a similar but more abbreviated analysis of the adaptability of the larger regional centres on Highway 16. The analysis is somewhat circumscribed because the Northwest Economic Opportunities Inter-Ministry Task Force's work concentrates on the Northern Zone. The primary concern of this section therefore is on the impact of proposed developments on existing centres, and in particular whether there are any serious constraints which may prevent these centres from participating in potential developments. The analysis then is less comprehensive, more constrained and more focussed than the analysis for the Northern Zone. The background paper -- "Adaptability of Existing Regional Centres in the Southern Zone" -- provided the information summarized in this section.

4.3.1 Smithers

Smithers is a well established, stable community with moderate growth prospects and a high level of services. It has undertaken the necessary planning and infrastructure development to accommodate a moderate growth rate of 4% over the next decade:

- sewer and water systems have a capacity of up to 7,500 people; and
- an ample supply of developable land is available and the basic road network is in place.

At present there are no major constraints to moderate urban expansion within the town. However, there is a significant urban fringe problem in the Smithers area, particularly the Lake Kathlyn area where there are water contamination and sewage problems.

The Town of Smithers, adjacent rural areas and the neighbouring Village of Telkwa would welcome economic diversification and growth. While Smithers will continue without doubt to fulfill its regional service role, it unfortunately is not well situated to serve as a daily commuting base for proposed mines. With its well developed urban amenities and its expansion capacity, it should be considered as a candidate for potential block time commuting schemes.

4.3.2 The Hazelton Area

The Hazelton area is comprised of two incorporated municipalities -- the Village of Hazelton (population 393) and the District of New Hazelton (population 712) -- the Improvement District of South Hazelton, four Indian Reserves and several unincorporated rural areas. In terms of level of service, the Hazeltons are collectively midway between Stewart and the larger cities. A significant population increase would, with the possible exception of Hazelton, require major expenditures. The communities are not well situated to serve as daily commuting bases for mine developments although they are the closest communities to the mine developments. They should be considered, however, as potential residential bases for long distance, block time commuting strategies. Although excess service capacity is not available, an unstable forest economy implies that a labour force may be. Significant expansion may require a major restructuring of local government.

4.3.3 Terrace

Terrace is a well established community with a broad service base but with a slow rate of economic development. The population increased approximately 1.3%/annum from 1976 to 1981. Basic sewer and water systems are designed for populations of 20,000 and 35,000 respectively, but there are problems with both systems that need rectification. An adequate supply of developable land is available for projected growth.

Two major constraints to growth are evident. First, an unresolved urban fringe problem (the Thornhill area which is discussed in further detail in section 7.1) can be a constraint to growth. Second, the weak municipal fiscal capacity of Terrace, largely due to a narrow industrial base, is of concern. Furthermore, the stability of the existing economic base which is highly dependent on forestry is problematic, particularly given current conditions in the industry. In short, economic diversification is desperately needed.

Although Terrace is not well situated to serve as a daily base for commuting to the potential mine developments, it is a major regional service centre hence it would likely play a significant role in support of the resource development. Furthermore, given its narrow economic base, limited fiscal capacity and the desire for diversification and growth, Terrace should be considered the prime candidate to serve as a base for a block time air commuting scheme.

4.3.4 Kitimat

Kitimat is a diversified industrial centre with a high level of services and a moderate growth rate. The District is

well equipped to deal with growth in terms of land supply, sewer and water, and major road capacity. Its strong economic base, high service levels and ample fiscal capacity mean that Kitimat is the best advantaged community in the region. Further growth and diversification are desired and could easily be accommodated. Kitimat therefore should be considered as a potential candidate for supplying workers to any block time commuting scheme, although it is less in need of the growth than its neighbours -- Terrace, Smithers and the Hazeltons.

4.3.5 Stewart

Stewart is a small (population 1,456), well established mining dependent community with a significantly lower level of services than communities on Highway 16. Nonetheless, it occupies a strategic location with respect to development of the region. The community's sanitary sewer, storm water and water systems are in need of major repair although adequate land supply for future growth is available. Two additional major problems with respect to expansion are the high cost of electrical energy and the potential for floods. The community would welcome growth and diversification, however Stewart is not well situated to serve as a daily commuting base for potential mine developments. This is unfortunate because it would benefit from the added employment, economic diversification and a broader fiscal base. Consequently, it should be considered as a candidate for a block time commuting scheme. The community is closer to potential mine developments than the communities to the south and has the advantage of a labour force skilled in mining. The disadvantages are the quality of its services, the high costs of major expansion away from the existing townsite and the difficulties of air access.

4.3.6 Prince Rupert/Port Edward

These two communities together constitute the largest centre in the region with a total 1981 population of 17,186. The economy is simultaneously experiencing growth due to development of the coal and grain ports and decline resulting from adjustment in the forest and fisheries sectors. The "Prince Rupert Sub-Regional Growth Management Plan" anticipates 1995 population of approximately 22,000 under the most probable scenario. Sufficient capacity in major services to accommodate growth of this magnitude exists in the Prince Rupert sub-region, although not in Port Edward. A major constraint to growth, however, is high housing construction costs due to difficult terrain.

Prince Rupert and Port Edward are well placed to serve as a regional centre to service potential resource developments but they are not well situated to serve as a base for daily commuting to potential mine developments. The area would have distinct advantages as a regional centre due to its high level of services and amenities. The disadvantages are the airport access difficulties and significantly higher housing costs than other competing regional centres. Furthermore, the fact that the area is already growing could aggravate housing costs and lead to servicing problems.

4.3.7 Evaluation of Community Adaptability

Table five summarizes the adaptability of the regional centres in the Southern Zone. In contrast to the Northern Zone these communities are larger, more established and possess a broader range of services and institutions. Furthermore, they all share a concern for greater economic diversification, population growth and broadening of the

fiscal base. Tables six and seven illustrate population change and fiscal capacity. However the tables show a fair degree of variation. In fact, there is a great diversity in conditions between communities, consequently each should have a different role in the development of the region. Although none of the communities is well placed to serve as a daily commuting base for potential mine developments, a number of potential roles are apparent. These are:

- Terrace/Kitimat, Smithers and Prince Rupert/Port Edward will likely continue to play major roles as regional service centres in support of industrial development;
- Terrace/Kitimat and Smithers/Hazelton are ideal candidates for consideration as bases for block time commuting for a number of reasons: excess capacity in community services, need for economic diversification, quality of airports and closeness to potential mine developments; and
- Stewart has potential as a base for block time commuting, but significant growth would require significant capital expenditures. Its role as a port for development of the region seems assured.

4.3.8 Strategy for Development and Implications

The existing regional centres will participate in development in two ways: as regional centres providing a wide range of public and private services in support of developments in the region and possibly as residential bases for mine workers. The former role -- regional centre -- is well established and is not in doubt. The latter role is desirable but requires further examination as to its feasibility. While daily commuting to the mine sites can be rejected due to travel time and costs, block time commuting where workers travel to the worksite and work on site in blocks of time ought to be considered.

Table Five: Evaluation of Community Adaptability: Existing Regional Centres in the Southern Zone

	EXISTING COMMUNITY RESOURCES	COMMUNITY DESIRES	CAPABILITY TO EXPAND
TOWN OF SMITHERS	A well established, stable community of medium size (4570), and broad service base. The economy is diversified although not growing rapidly.	Desire for growth and diversification is strong.	The community is well equipped to handle expanison. It has a relatively strong fiscal position and moderate expansion in economic prospects. A local government structure problem in urban fringe.
DISTRICTS OF TERRACE AND KITIMAT	Kitimat (pop. 12 800), is a well established industrial centre with a growing population, diversifying economic base and a broad range of services with excess capacity. Development prospects are good. Terrace (pop. 10 900), is an older more established community with a broader service base but a narrower economic base. Its development prospects are weaker than Kitimat or Prince Rupert.	Desire for growth and diversification is strong.	Terrace is well equipped to handle growth in terms of land supply and services. Sewerage system needs upgrading. Major local government restructure required to deal with major urban fringe problem. Financial capacity is not strong as compared to Kitimat or Prince Rupert. Kitimat has no constraints to growth.
DISTRICT OF STEWART	Stewart is smaller (pop. 1450), less diversified community dependent on the mining industry. The level of services is low but the community is well established. The economic prospects over the longer term are good in terms of a port, mining, forestry & transportation although short term dependence on mining is problematic.	Desire for growth and diversification is strong.	Major renovations to sanitary, storm and water systems required. Electrical energy is constraint: diesel supplied. The fiscal position is relatively strong, however highly dependent on one taxpayer. Major expansion of community would require major capital costs. Community has mining labour force.
CITY OF PRINCE RUPERT/ VILLAGE OF PORT EDWARD	Prince Rupert is a large, well established centre with diversified economic base, wide range of services, strong fiscal base. It has good development prospects without proposed mine development. Port Edward is part of the Prince Rupert sub-region. It is small (pop. 1000) with a weak economic base and narrow range of services.	Desire for growth and diversification is strong.	Major study underway to determine capability to expand. Costs are higher than other areas due to terrain. Prince Rupert is the best serviced community in the region and has the strongest financial position. However, the land development costs are high. Port Edward lacks the capacity to expand but has improved fiscal capacity due to tax base sharing agreement with Prince Rupert.
VILLAGE OF HAZELTON & DISTRICT OF NEW HAZELTON	Both communities are small (pop. of 393 & 712) with a low level of services, narrow economic base and restricted employment opportunities.	Desire for growth and diversification is strong.	Both communities have limited services and current capacity to expand. Both have weak fiscal bases.

Table Six: Existing Regional Centres in the Southern Zone: Population Change by Municipality 1971 - 1981 (percentage change)

Municipality	1971	1976	1977	1978	1979	1980	1981
Hazelton (V)	351	371 (5.6)	348 (-6.2)	343 (-1.5)	357 (4.0)	346 (-3.1)	393 (14)
Kitimat (D)	11,803	11,956 (1.3)	11,669 (-2.5)	11,863 (1.6)	11,382 (-4.1)	11,466 (.01)	12,814 (12)
Stewart (D)	1,357	1,382 (2.0)	1,330 (-4.0)	1,273 (-4.3)	832 (-35)	1,159 (39)	1,456 (26)
Terrace (D)	9,991	10,251 (2.6)	9,863 (-3.8)	9,695 (-1.8)	9,850 (1.6)	10,167 (3.2)	10,914 (7)
Smithers (T)	3,864	3,797 (-2.0)	3,838 (1)	3,891 (1)	4,087 (5)	4,239 (4)	4,570 (8)
New Hazelton (D)	351	474 (35)	348 (-27)	343 (-2)	357 (4)	346 (-3)	712 (105)
Port Edward (V)	1,019	1,189 (16.7)	1,181 (-0.7)	1,163 (-1.6)	1,134 (-2.5)	1,045 (-8)	989 (-5)
Prince Rupert (C)	15,747	14,754 (-6.4)	14,797(0)	14,886 (1.0)	15,092 (1.0)	15,637 (4)	16,197 (4)
Stikine R.D.	1,470	1,545 (24)	1,811 (17)	2,125 (17)	2,170 (2)	2,157 (-0.6)	

SOURCES: 1971, 1976, 1981 Statistics Canada; 1977, 1978, 1979, 1980 "British Columbia Municipal Population Estimates 1980" Central Statistics Bureau

Table Seven: Existing Regional Centres in the Southern Zone: Assessment Base Per Capita: 1982

Municipality	Total General Assessed Value 1982 [1]	Population[2] 1981	Assessment/Capita
Kitimat	$126,593,144	12,814	$9,879
Stewart	$10,531,142	1,456	$7,233
Terrace	$43,111,413	10,914	$3,950
Hazelton	$684,660	393	$1,742
New Hazelton	$1,837,377	712	$2,580
Smithers	$24,610,792	4,570	$5,385
Prince Rupert	$96,802,091	16,197	$5,977
Port Edward	$8,063,079	989	$8,153

SOURCES:
1. B.C. Assessment Authority
2. Statistics Canada

The advantages of considering block time commuting for regional centres are listed below:

Economic diversification and stabilization. A commuting scheme would mitigate the boom-bust, single industry town syndrome. Commuting would avoid development of new single enterprise communities while contributing to the stabilization of regional centres by increasing employment and population as well as diversifying economic bases.

Business sector development. Because of the perception of stability, a multiplier effect is created which increases business interest in the community. There is also less restriction to entry for businesses in existing towns than new ones because there is a reduced company influence. Further, since the scale of businesses is normally larger in existing towns, the businesses are generally more financially viable.

Existing service capacity. Existing centres have, for the most part, excess capacity in their community services. Increased population would consequently mean, in many cases, more thorough use of existing facilities rather than expansion. If expansion is necessary there are financial costs but these would likely be less than for new town development.

Integrated housing markets. An integrated housing market in existing regional centres provides a greater housing choice to new residents, particularly to those who are not mining company employees.

Social costs. The utilization of existing regional centres with their existing base of services/facilities, as well as

established social networks and community groups avoids the social difficulties individuals and families face in relocation to new communities.

Risk and uncertainty. The regional centres can in many respects absorb the extra population growth through excess capacity of services and facilities, consequently the costs of new infrastructure are reduced. There is, as a result, less risk and uncertainty for an existing town than for a new town in accepting the growth.

Manageability. New town development is largely dependent on provincial initiatives to minimize social costs. Existing communities can more likely handle a greater burden of growth management on their own.

Community desires. Existing regional centres will likely favour growth because of the increase in economic diversification, employment opportunities and service levels.

In selecting one or more host communities for a Southern Zone commuting scheme, each of the above factors will have to be weighed and balanced for every town. At the same time, a number of unique community development problems would arise which need attention:

Taxation. A long distance commuting scheme may create property tax problems since the mine site is outside municipal boundaries. The situation is compounded if there are several communities and/or companies involved. An appropriate tax and revenue sharing scheme is necessary.

Risk and uncertainty. There is a possibility of over-development of town infrastructure. New residents may not

remain in the community since, with the commute option, employees have greater flexibility with respect to living in various communities. Over-development of town infrastructure may also result if anticipated employment projections are not realized. This would be the result of the mine company reducing employment in an attempt to reduce operating costs. Co-ordination is required and could be achieved through negotiation of comprehensive agreements and co-ordinated planning by both the public and private sectors.

Community costs. Since employees work on a rotation schedule, they are unable to play a regular role in the community. This may to some degree erode community leadership and consequently community organizations and functions. Further research is necessary on this issue.

It has been concluded that block time commuting as a strategy for involvement of regional centres in the development of the region may have merit and therefore warrants further examination. The points above require attention and should be addressed before a decision is made to proceed with block time commuting on a large scale.

4.4 Implications of Commuting

Section 4.2 and 4.3 have established the desirability of providing existing communities in the Northern and Southern Zones with the opportunity to participate in development of the region. Block time commuting strategies were suggested as a means to this end. This section examines both the daily and block time commuting option in more detail.

The design of a commuting scheme needs to be cognizant of a number of technical/financial criteria as well as social criteria relating to the worker, the family, the community and the job site (figure eight). The most usual form of commuting is daily commuting, yet block time commuting is becoming increasingly popular, particularly for smaller, more remote operations. While experience with block time commuting is growing, the overall level of experience with block time commuting is limited as compared to experiences with new or expanded communities. Table eight summarizes the most significant commuting operations in Canada.

The subsequent sections examine both the block time commute and the daily commute strategies. Two general commuting schemes are developed and evaluated, first from a technical/financial and then from a social perspective. The analysis of commuting schemes which serve particular mines is not done in this section but in Chapter 5 which evaluates the settlement options for each mine group.

4.4.1 The Two Transportation Schemes

There are two transportation schemes suggested: one to accommodate commuting to the mine sites from the northern communities and one to accommodate commuting from the southern communities. Following is a description of the two schemes.

The southern transportation scheme. This would provide opportunities for residents of the larger regional centres to participate in development of the region. The destination points are the individual mines: Stikine, Sustut, Letain/Eaglehead/Kutcho, and Red Chris. The larger regional centres -- Prince Rupert, Terrace/Kitimat, Smithers

Table Eight: Mine Development in Canada Employing Block Time Commuting

Mine and Product	Location	Rotation Scheme	Staging Points
1. Echo Bay Mines (gold)	Echo Bay Northwest Territories	O.P. 2 weeks on/2 weeks off U.G. 3 weeks on/1 week off	. four points: Cambridge Bay; Coppermine; Yellowknife; Edmonton
2. Cominco Ltd.: Polaris Mine (uranium)	Little Cornwallis Island Northwest Territories	Innuit: 6 weeks on/4 weeks Non-Innuit: 10 weeks on/2 weeks off	. eight points: Resolute; Coppermine; Frobisher Bay; Clyde River; Cambridge Bay; Pangnirtung; Igloolik; Cape Dorset; Pond Inlet; Yellowknife
3. Amok Ltée (uranium)	Cluff Lake Saskatchewan	. eleven hours/day . 7 days on/7 days off	. agreement guarantees at least five destination points in the north
4. Key Lake Mining Corp. (uranium)	Key Lake Saskatchewan	. eleven hours/day . 7 days on/7 days off	. agreement guarantees at least six pick-up points in the north
5. Gulf Minerals (uranium)	Rabbit Lake Saskatchewan	. eleven hours/day . 7 days on/7 days off	. six points including: Black Lake; Stoney Rapids; Fond duLac; Uranium City; Prince Albert; and Saskatoon

Figure Eight: Technical and Social Criteria for Developing Commuting Schemes

1. Region/Community

- employment
- economic diversification/stabilization
- service capacity
- social costs of expansion
- risk and uncertainty
- manageability
- community desires

2. Technical/Economic

- transportation network
- mode
- capital cost
- operating cost
- travel time
- reliability
- safety
- logistics

3. Social

- employment
- social stability
- family cohesion
- workforce productivity
- safety
- leisure
- mode preferences

4. Enterprise Operations

- productivity
- supervision
- logistics
- turnover
- safety/health
- operating costs
- capital costs
- recruitment
- travel time

and Stewart -- are the primary origin points. The transportation scheme between the destination point (mine) and the primary origin point (community) must meet a commuting time restriction of 45 minutes daily or 3 hours block time. For convenience it was assumed that the employees will work a 7-day on, 7-day off schedule with two 12-hour shifts. For a daily commuting scheme, one-quarter of the total workforce will travel to the mine site and one-quarter will travel from the mine site twice in a 24-hour period. For a block time commuting scheme, the transportation schedule will cycle one-fifth of the total workforce for five weekdays. This means that one-tenth of the workforce will arrive and one-tenth will depart from the mine site on one of the weekdays. This pattern is continued for all five days of the transportation schedule.

For the block time commute scheme, this five day transportation schedule is a very simple design. Commuting options can involve more complex transportation schemes with different origins for different days. The number of days also can be reduced, increasing the number of employees transported per day and perhaps leading to increased economies of scale. We concentrated on the basic five day scheme proposed, however significant variations are possible, each having different economic/technical implications.

The northern transportation scheme. This would provide opportunities for the existing local residents, particularly the indigenous residents, to participate in the development of the region, thereby meeting one of the identified social objectives. The northern zone schemes have the same destination points as the southern zone schemes but the origin points are the existing communities of Dease Lake, Iskut/Eddontenajon and Telegraph Creek.

A daily scheme was not considered feasible because these communities would be unable to supply the requisite number of workers for a daily scheme without radical community expansion. Hence a block time commuting scheme was assumed. Each trip would carry a maximum load of 15 passengers. Furthermore, only one commuting day per week would be required for each of the northern communities to each of the mines. The commuting time limits would be the same: 45 minutes daily and 3 hours block time. This would minimize commuting costs and maximize community cohesion and continuity.

4.4.2 Technical and Financial Considerations for Commuting

Direct distances between origin points (community) and destination points (mine) are indicated in table nine. It is assumed that an airport is available with 10 km of mine sites, hence these distances could vary depending on where an airport is located. Each air route examined has a primary community origin and a single mine destination. It has been assumed that if residents of communities other than the primary centre wish to work at the mine site then they must make their own way to the primary centre. Furthermore, a single mine destination is used although it is possible that, in practice, networks may connect several centres to several mines.

Aircraft capital and operating costs have been developed for the Southern Zone scheme assuming use of the following equipment:

- the daily commute from the southern zone assumes a chartered 90 - 150 seats Boeing 737;
- the southern block time commute assumes a 30-35 seat de Havilland Dash 7 or a British Aerospace HS 748 dedicated to the network; and

Table Nine: Air Distance Between Originating Communities and Mine Destinations in Nautical Miles

Origin Communities	Stikine	Schaft Creek	Red Chris	Eaglehead	Letain	Kutcho	Klappan	Sustut
Prince Rupert	179	186	203	182	250	249	179	189
Stewart	91	92	103	151	151	151	82	115
Terrace	193	194	196	237	236	232	158	144
Smithers	203	199	191	233	218	215	144	110
Telegraph Creek	41	31	46	72	82	87	94	162
Dease Lake	84	69	46	33	41	48	89	149
Iskut	60	43	12	46	51	57	60	125

- the northern block time commute assumes a 19 seat de Havilland Twin Otter.

Further, it is assumed that the operation is safe and a 90% reliability factor is achieved.

In addition to aircraft equipment the following items to ensure operational safety and reliability are required:

- an on-board computerized navigation system not dependent on ground aids;
- a micro-wave landing system (estimated cost of $750,000); and
- a 1500m runway for the B737 costing $9 million or a 1200m runway for a Dash 7 or HS 748 at $4 million (all weather) or $1.4 million (good weather).

The evaluation of the southern commuting schemes is summarized in table ten and table eleven. It has been concluded that:

- daily commuting by air is infeasible due to travel times;
- block time commuting is feasible in terms of travel time provided the residence is located reasonably close to the airport and the airstrip;
- the high operational cost per person and the high costs of airport and enroute facilities may not be acceptable to a particular mine company;
- additional studies of reliability are required;
- the most favourable schemes in terms of travel time and cost are in order: Smithers/Sustut; Terrace/Red Chris; Terrace/Eaglehead-Letain-Kutcho.

There is, all things considered, reason to consider a commute from southern centres as a viable proposition.

The northern commuting schemes have not been evaluated extensively because of the small proportion of workers involved in the commute. The northern strategy clearly has important social benefits that warrant more detailed investigation in the future. It is necessary, however, to identify company and community preferences before a reasonable set of transportation schemes can be examined further.

Table Ten: Travel Time Per Commuter

DAILY COMMUTE WORK SCHEDULE

TERRACE TO:	AIR TIME HR/MINUTE	GROUND TIME HR/MINUTE	TOTAL TIME HR/MINUTE
E/L/K	0:49	0:40	1:29
STIKINE	0:41	2:00[1]	2:41
RED CHRIS	0:42	0:40	1:22
SMITHERS TO SUSTUT	0:30	0:40	1:10

BLOCK COMMUTE WORK SCHEDULE

TERRACE TO	AIR TIME[2] HR/MINUTE	GROUND TIME HR/MINUTE	TOTAL TIME[3] HR/MINUTE
E/L/K	1:13	0:40	1:53
STIKINE	1:01	2:00[1]	3:01
RED CHRIS	1:02	0:40	1:42
SMITHERS TO SUSTUT	0:41	0:40	1:21

1. Physical features probably eliminate an airport in the near vicinity of the minesite. Time shown includes unloading fixed-wing aircraft/several helicopter shuttles to minesite.
2. BAE-748 Aircraft
3. Add 1 to 1-1/2 hours travel time for air journey between secondary and primary origin communities.

Table Eleven: Travel Cost per Commuter

DAILY COMMUTE WORK SCHEDULE

TERRACE TO:	AIR COST	GROUND COST	TRAVEL COST
E/L/K	$27.71	$ 4.00	$31.71
STIKINE	24.11	38.70[1]	62.81
RED CHRIS	23.75	4.00	27.75
SMITHERS TO SUSTUT	16.97	4.00	20.97

BLOCK COMMUTE WORK SCHEDULE PER COMMUTER

TERRACE TO:	AIR COST	GROUND COST	TOTAL COST[2]
E/L/K	$58.61	$ 4.00	$62.61
STIKINE	44.13	38.70[4]	83.83
RED CHRIS	53.73	4.00	57.73
SMITHERS TO SUSTUT	38.53	4.00	42.53

1. Cost includes helicopter shuttle - airport to minesite assumed distance 20 N.M. Boeing-Vertol BV 234.

2. Does not includes cost of transportation between secondary primary origin communities. (A typical cost might be $60).

4.4.3 Social Implications of Commuting

A commuting scheme has the followng components: an origin point(s); a work schedule; a mode of travel; and a destination. The focus of this section is on the social implications of a block time commuting scheme. As indicted above daily commuting from southern communities is technically dubious, socially undesirable and extremely expensive. Daily commuting from existing northern communities is not feasible without radical expansion of those communities, a prospect which is not considered desirable for a number of social reasons. Consequently, this section provides a social evaluation of block time commuting focussing on its implications for the worker, the worker's family and the worksite. Particular consideration is given to the opportunities and problems of involving native communities. It should be emphasized that while there is practical experience with block time commuting in Canada and a growing evaluative literature, the overall experience is limited as compared to what is known about new or expanded resource based communities. Table eight summarizes the characteristics of the most significant schemes in the country, while subsequent sections summarize what is currently known from the perspective of worker, family, company and native people.*

The worker. The advantages of a commuting scheme to a worker is that he is able to stay in a larger, more established community with a high level of services, better housing choices and greater family social opportunities. He avoids a move to a new community without these social

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* A more complete discussion is contained in the technical report by the Social Group entitled "Northwest Economic Development Opportunities: Socio-economic overview".

advantages. The extra leisure time and family time also is valued. One study has demonstrated the potentially high interest in such schemes particularly in larger centres [Elco Mining Ltd., 1981]. The potential disadvantages are:

- anxiety about separation from the family particularly if rotation is long;
- travel fatigue;
- possible arguments for travel time compensation;
- loss of community roots; and
- inability to use camp leisure time effectively.

The consequences of block time commuting for the worker need further evaluation.

The family. The benefits to the family, particularly women, of a commuting scheme include avoiding the trauma of relocation as well as retaining the services, the amenities and the social opportunities, social cohesion and friendship networks of the established community. The negative consequences are anxiety experienced when the husband is absent and family difficulties experienced in adjusting to changing roles when the husband is home. Further research is necessary on the extent of the problem and possible ameliorating actions.

Workforce productivity. The block time commuting schemes in existence in Canada have illustrated that they can provide a stable workforce. However, there are some problems:

- sensitive labour management relations are required which is more demanding of management;
- the logistics of delivering workers leads to some inefficiencies in production;
- extra costs due to duplication of supervisory positions are possible;
- the inability to provide overtime for tradesmen, hence possible recruitment problems;
- operating costs may be higher, hence the company may restrict output or substitute capital for labour thereby lowering overall employment;
- although no concrete evidence has yet been found linking productivity and safety problems to long

shifts, there is reason to suspect that fatigue and anxiety may cause such problems;
- there is uncertainty as to future operating costs due to unions and the inflexibility of shifts; and
- loss of psychic income for company executives who might value the whole notion of owning a town.

In conclusion, the block time commute scheme provides a stable workforce, particularly in comparison to a new town. However, further evaluation of the implications for worksite safety and productivity is required.

Native people. Extensive experience is available on employment of native peoples in block time commuting. The advantages are many including:

- natives are able to maintain the opportunity of their traditional occupation -- trapping and hunting -- in their spare time;
- a region obtains a pool of skilled workers who can work at other sites;
- the company obtains a stable resident workforce who learn quickly; and
- a stimulus is provided to the local community through spending of wage income.

Negative consequences that have been observed include the temporary disorganization of a community at the outset, increased economic expectations, possible jealousy between communities and increased anxiety and stress of families and workers due to separation.

Considerable effort in planning and implementation has to be expended in order to implement a successful native employment programme. First, natives are initially less skilled than southerners, hence training is required with the understanding that productivity will lag until skills advance. Furthermore, consultation with native communities is necessary to design the work schedule and training programmes, to orient prospective candidates, and to equip them to cope with possible problems. Experience in the past has shown that the recruitment of groups of native peoples

from the same community can assist in making the programme a success. Finally, native/non-native relations and labour/management relations need careful consideration in the programme design.

4.4.4 Conclusions

A set of commuting options have been developed and tested technically, financially and socially. The merits of block time commuting are clear, but a definitive opinion awaits further evaluation of block time commuting in the context of a particular mine project (a subject examined in the subsequent chapter). A block time commuting scheme is a radical innovation which produces a number of benefits but also can have certain social implications. Further research is required.

5.0 PRELIMINARY SETTLEMENT OPTIONS: IMPLICATIONS AND EVALUATION

This section outlines the range of settlement options which have been developed for each mine group. In addition, it analyzes the implications and evaluates the different settlement options. Figure nine illustrates the range of these settlement options. The analysis of implications and the evaluation is based to a large extent on a series of background papers and appendices to this report. These papers focus on the following issues:

- the population implications of the settlement option;
- the community services and facilities that would have to be provided;
- the housing requirements;
- the financial costs;
- the social implications of the option;
- the environmental implications in terms of impact on sensitive resources;
- the suitability of sites for development; and
- the feasibility of commuting.

Each mine group is discussed below.

5.1 Sustut Project

5.1.1 Options

The Sustut project is a small copper mine with an estimated peak workforce of 350 and a life span of only 8 years. Daily commuting using conventional modes of transportation from existing communities is infeasible due to the distances involved.* Preliminary analysis has indicated that a permanent townsite to serve this mine exclusively would not

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* Sustut is approximately 216 kilometres or 134 miles from Hazelton, the closest established community.

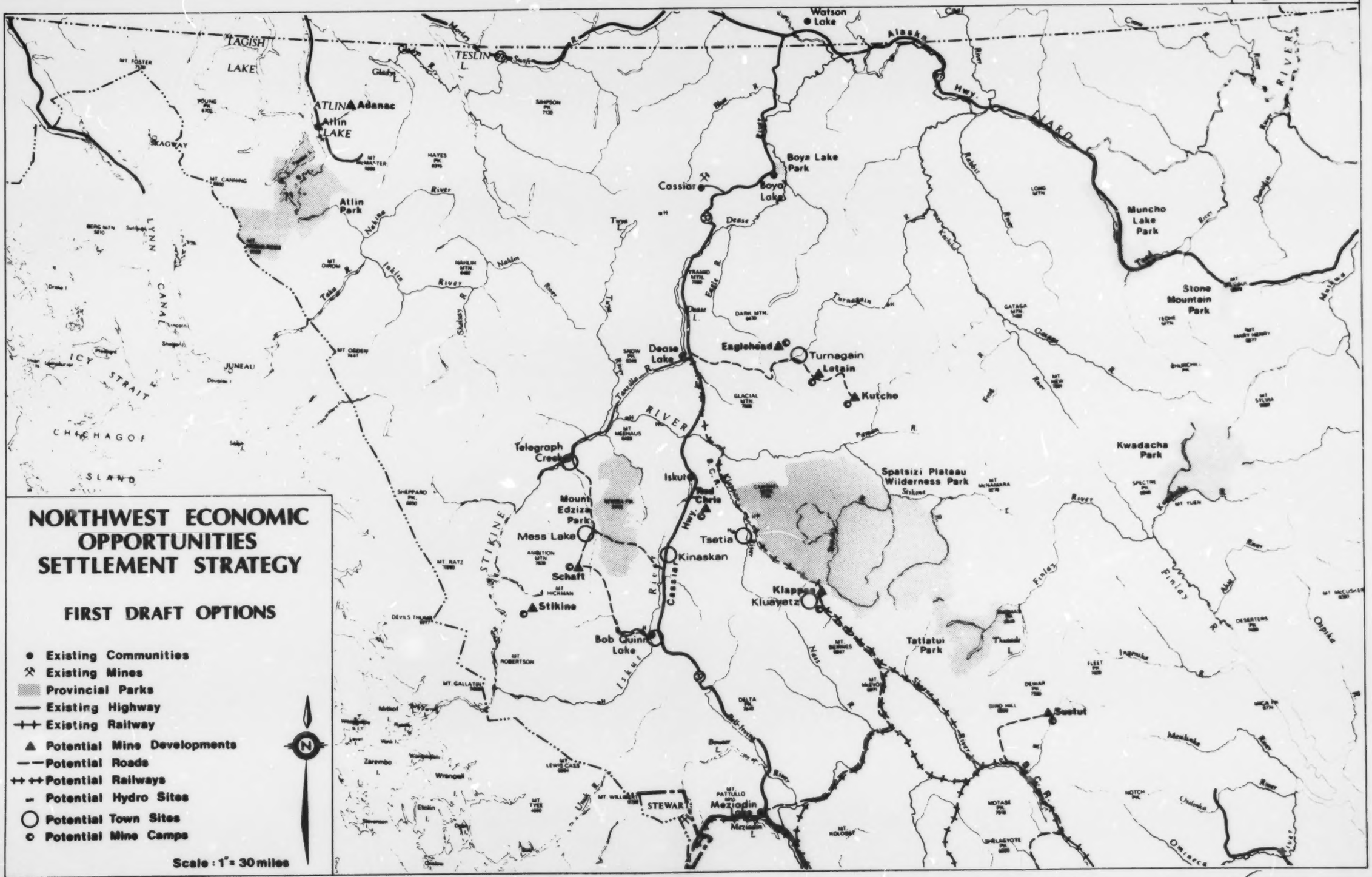
be desirable because of the small size of the mine, its short life span and the fact that currently no other mine projects have been proposed in the immediate vicinity. The most feasible option therefore appears to be a block time commuting scheme where employees commute to work at the beginning of their shift, are accommodated in a work camp during their shift, and return home at the end of their shift for their days off. A block time work shift might consist of seven days on/seven days off. Block time commuting would enable employees to reside in established communities such as the southern centres that are too distant from the mine site to permit conventional daily commuting.

5.1.2 Long Distance Commuting Option

Two possible commuting schemes were given preliminary technical evaluation: a daily commute and a block time commute, both originating at Smithers, 110 nautical miles away. The daily commute for Sustut is the most favourable of all of the schemes investigated for the Northwest Settlement Strategy in terms of travel time (1.2 hours each way) and the cost ($20.97 per trip). However, this scheme violates the daily time constraint of 45 minutes and is likely to be less favourable cost-wise than a sponsored block time commute.

The block time commute (seven days on/seven days off) meets the travel time constraint with a total elapsed time of 1.4 hours per trip. With a total round trip cost of $42.53 per 7-day period, this scheme would be relatively cost effective. The block time scheme would be focused on Smithers, a community readily adaptable to such a strategy (see section 4.3.1).

Figure Nine


NORTHWEST ECONOMIC OPPORTUNITIES SETTLEMENT STRATEGY
FIRST DRAFT OPTIONS
Existing Communities
Existing Mines
Provincial Parks
Existing Highway
Existing Railway
Potential Mine Developments
Potential Roads
Potential Railways
Potential Hydro Sites
Potential Town Sites
Potential Mine Camps
Scale : 1" = 30 miles
N
TAGISH LAKE
Adanac
Atlin LAKE
Atlin Park
SKAGWAY
JUNEAU
ICY STRAIT
CHICHAGOF ISLAND
LYNN CANAL
Nahlin River
Inklin River
Taku River
Tatlatui Park
Watson Lake
Alaska Hwy
Boya Lake Park
Cassiar
Dease Lake
Eagle Head
Turnagain
Kutcho
Muncho Lake Park
Stone Mountain Park
Kwadacha Park
Spatsizi Plateau Wilderness Park
Telegraph Creek
Mount Edziza Park
Mess Lake
Schaft
Stikine
Bob Quinn Lake
Iskut
Tsetia
Kinaskan
Klappan
Kluayetz
Sustut
STEWART
Meziadin
Stikine River
Cassiar River
Iskut River
Finlay River
Omineca River
Ospika
Parsnip R.
Peace R.
Liard River
Rabbit River
Toad River
Muskwa
Chukka
Ingenika
Nation R.
Sifton Pass
Turnagain R.
Dease R.
Tanzilla R.
Klastine R.
Kechika R.
Gataga R.
Gataga Mtn.
Laslui Mtn.
Dark Mtn.
Glacial Mtn.
Snow Pk.
Tramid Mtn.
Nahlin Mtn.
Hayes Pk.
Sheppard Pk.
Mt. Foster
Mt. Canning
Mt. Orchom
Mt. Orden
Mt. Robertson
Mt. Gallatin
Mt. Lewis Cass
Mt. Tyee
Mt. Williams
Mt. Pattullo
Mt. Holland
Mt. Nemaus
Mt. Hickman
Mt. Sylvia
Mt. Tuen
Mt. Silver Hebert
Mt. Sifton
Mt. Niven
Mt. Sidney
Mt. Ingenika
Mt. Mcclusky
Mt. Selwyn
Mt. Mcnamara
Mt. Laslui
Mt. Gataga
Mt. Sylvia
Mt. Harry Hebert
Mt. Mcclusky
Mt. Niven
Mt. Sidney
Mt. Ingenika

The environmental implications of a camp option are summarized in table twelve. Generally, environmental resource agencies favour a camp as opposed to a new community because of the less severe environmental impacts. The environmental implications are constraints and not absolute limitations to development of a camp. The access routes, however, may have significant environmental impact by providing access to previously inaccessible, hence protected, areas. The alternative routes therefore require careful consideration.

Environmental/resource agencies have suggested that the Sustut mine should be considered in the context of the Klappan Coal Project. If the proposed MacEvoy Flats site (see section 5.2.1) proves feasible as a town site for the Klappan project, it may also serve the Sustut project. Although the estimated length of the commute of 69 km (46 miles) may be at the limits of daily commuting the advantages of a larger more diversified community make it worth considering.

5.1.3 Evaluation

A block time air commuting scheme is recommended for further evaluation. If the MacEvoy Flats site proves feasible for Klappan Coal then consideration should be given to it being a base for Sustut workers as well.

5.2 Klappan Coal Project

5.2.1 Options

The Klappan mine has two possible scenarios -- a low production scenario of 1 mmtcc per annum and a high

production scenario of 4 mmtcc per annum. The project is beyond daily commuting distance from existing communities*. The low production scenario would not create a desirable community because of the small population resulting from a workforce of 450, the consequent low level of services and the high per capita costs. The low employment level on the other hand would make it more feasible to commute either on a daily or block time basis. The high production scenario with its employment of 1,250 would result in a larger town with a higher level of services and lower per capita costs. A new community also would be central to other coal developments in the immediate region.

Two possible sites were examined by environmental/resource agency reviewers:

- Kluayetz: located adjacent to the mine site at the intersection of the Little Klappan, Skeena and Spatsizi Rivers and Kluayetz Creek; and
- Tsetia: located 58 kilometres (36 miles) north of the mine site on the B.C.R. grade.

In addition to the above, reviewers suggested a third potential site, located on the Skeena, 58 kilometres (36 miles) south of the Klappan mine site at a site called MacEvoy Flats. This site was forwarded for further consideration with the view that it would be less damaging to the environment and could present a number of social benefits which are discussed below.

5.2.2 New Community Options

A Kluayetz or Tsetia town would initially serve only one project -- the Klappan Coal Mine. Construction of the mine and the townsite would commence in 1987. The operating

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* The nearest communities -- Iskut/Eddontenajon -- are 113 kilometres or 70 miles to the north and the west.

Table Twelve: Environmental Evaluation of Settlement Options:

Sustut Copper Project

Option	Environmental Impacts	Urban Suitability/Livability	Conclusions & Recommendations
A. Camp	Area has high to moderate mineral potential. Mineral occurences need to be protected. A camp could assist in exploration of other deposits. High fisheries values are evident for a variety of types of fish. No information is available on agriculture. No park or park proposal is affected. No heritage information is available but moderate potential and good possibility of impact. In terms of wildlife there are sensitive caribou populations, Guides, outfitters, trappers and natives utilize wildlife in area.	Possible limiting factors are the following: the gravel supply is not known; terrain is difficult particularly in terms of access from existing rail grade; the climate is severe although snow depth is low; and an avalanche hazard exists in Sustut and tributary valleys. In terms of urban livability there are good outdoor recreation opportunities. There are no water quantity problems, or impacts on other water users and water quality is unlikely to be limiting factor. Location of camp should be: - upwind of mine to avoid fugitive dust and trace metals; - at bottom of Moose Valley, on low south or southeast facing slope, or in Sustut Valley upstream from Moose Valley on south or southeast slope below treeline, not in Sustut Valley for climate; - near Moosevale Flats to facilitate mineral exploration;and - slopes of Sustut or tributary valleys because of avalanche hazard.	More detailed environmental and urban suitability analysis required.
Conclusions	It has been concluded that there is no resource conflict which requires this option be eliminated. The camp option is preferred to a townsite by several agencies because impacts are fewer and less severe. A camp could benefit in further mineral exploration.	A suitable campsite could be identified, but problems such as difficult terrain, avalanche hazard and severe climate. Access to camp will be a problem. A camp should avoid: - gravel deposits; - mineral occurences; - valley bottoms, shorelines, confluences and - mouth of creeks; and - caribou range and moose yarding areas.	Detailed studies on environmental impact and urban suitability will be required when choosing site. Alternative road corridors need to be looked at including Sustut and Mosquet Niven. A townsite at MacEvoy Flats should be investigated to serve both Klappan and Sustut. It has the following advantages: - environmentally less sensitive; - closer to regional centres; - multi-company: other coal mines; - multi-resource: forestry; and - regional transportation focus

workforce would begin to arrive in 1989. Full employment of 1250 would be reached in 1990. The community would grow from approximately 800 in 1989, to 2100 in 1990, peaking at 3000 in 1991.

Table thirteen summarizes the facilities requirements for a community of 3000. The community would be reasonably well endowed with services.

The housing requirements would, at peak population, be as follows:

social unit type	total	housing type			
		detached	attached	apt.	mobile
1. families	363	272	18	18	54
2. couples	386	174	39	97	77
3. singles	323	16	16	242	48
total units	1072 (100%)	462 (43%)	73 (7%)	357 (33%)	179 (17%)

The capital costs for a Klappan town are summarized in table fourteen. Of the approximately $126 million dollars in total costs, the greatest proportion, $70 milion or 55%, is housing.

A new community, regardless of its location, would have a number of social problems typical of new resource based communities, problems which have been well documented in resource based community literature (see Conceptual Plan: Update, MMA, 1981). These problems are most severe in the early years of the community and include:

- physical and social isolation;
- a low level of social services due to lags in providing services and facilities;

Table Thirteen: Kluayetz/Tsetia Town: Facilities Programme

YEAR	1989	1990	1991	1992	1993	1994	1995	TOTAL
population	809	2142	2937	2937	2937	2937	2937	
facilities (in ca):								
Elementary School/ Secondary School	2520	0	0	0	0	0	0	2,520
Community College	0	0	500	0	0	0	0	500
Diagnostic Centre	0	250	0	0	0	0	0	250
Ambulance	0	150	0	0	0	0	0	150
Day Care Facilities	0	150	0	0	0	0	0	150
Social Agencies	0	100	0	0	0	0	0	100
Recreation Centre	0	3,625	0	0	0	0	0	3,625
Commun. Pk.	10,350	17,000	10,000	0	0	0	0	37,350
Neighb. Pk.	11,600	19,000	11,500	0	0	0	0	42,100
Tennis (No. Courts)	0	2	0	0	0	0	0	2
Library	0	185	0	0	0	0	0	185
Municipal Hall	200	0	0	0	0	0	0	200
Public Works	280	0	0	0	0	0	0	280
Fire Protection	150	0	0	0	0	0	0	150
Police/RCMP	20	0	0	0	0	0	0	20
Retail, Office, Etc.	728	1,200	715	0	0	0	0	2,643
Hotel/Motel	647	1,300	640	0	0	0	0	2,587
Service Commercial	200	333	200	0	0	0	0	730
Light Industrial	3,700	3,700	0	0	0	0	0	7,400
Post Office	120	0	0	0	0	0	0	120
Telephone	500	0	0	0	0	0	0	500

Table Fourteen: Capital Cost: Kluayetz/Tsetia Town ($000)

Social Facilities	
- public	$10,454
- private	8,906
Housing	69,796
On-Site Physical Services	22,163
Off-Site Physical Services	10,490
Commercial/Camp/Industrial	1,343
Planning & Development	2,775
TOTAL	$125,927

Note: All costs are in mid-1982 dollars and are order of magnitude estimates only.

- lack of social stability and cohesion;
- initial problems of a limited array and stability of commercial services;
- problems of new residents, in particular women and children, in adjusting to a new job, a new home and a new community.

The severity of these problems is dependent, to a large extent, on the degree of company and government commitment to avoid or ameliorate these problems through planning and design of appropriate mitigation measures. The long life span of the resource, the size of the community and its potential diversity argue for greater government commitment. A major corporate commitment would be required as well.

In terms of social implications, the Tsetia site is the most isolated of the three, the least central to potential coal developments, the most removed from regional transportation networks and the furthest community from the minesite. The Kluayetz site is the closest to the minesite in terms of travel time but would be influenced by the coal operation itself. The MacEvoy Flats site should receive further consideration because it is:

- located at the nexus of regional transportation routes;
- accessible to both coal and forestry development prospects; and
- the most proximate to regional centres on Highway 16.

Both the Tsetia and the Kluayetz sites are equally suitable from an urban livability perspective (table fifteen). The Tsetia site has a more favourable climate and would experience less impact from mine pollution. Kluayetz, on the other hand, has slightly better recreational opportunities.

Not only are both sites equally preferable from an urban suitability perspective but both sites have equally serious environmental implications. They are located in an area of high environmental quality and extreme sensitivity. The

Table Fifteen: Environmental Evaluation of Settlement Options

Klappan Coal Project

Option	Environmental Impacts	Urban Suitability/Livability	Conclusions & Recommendations
A. Kluayetz Town	The site would have serious environmental implications for Spatsizi Park and adjacent areas. These are outlined below: - wilderness quality lowered; - increased management effort and costs for the park; - significant wildlife population--specifically caribou, sheep and goat--susceptbile to disturbance; - high fisheries value affected; - possible impacts on guides and outfitters; - high potential heritage resources; and - registered trapline effected.	Site conditions for townsite development are favourable in terms of soils, terrain and water supply. Various hazards would have to be avoided including floodplain, escarpments and potential avalanches. Site is sunny but has high snowfall and exposure to strong winds. The site is attractive in terms of proximity to wilderness, wildlife viewing, canoeing and hiking. Kluayetz is closer to mine than Tsetia hence the advantage in terms of commuting. Air quality could be a problem. Gravel study required. The major negative factor of Kluayetz is its closeness to mine: air quality, noise and aesthetics would be problems.	More detailed environmental and urban suitability site analysis required.
B. Tsetia Town	Environmental implications are similar to and as severe as Kluayetz. In addition, - the winter moose range, sheep and goat population in Eaglenest Cr. and connecting gulleys could be affected; and - native hunting area affected.	Site conditions for townsite development are favourable. Hazards, including floodplains, avalanche zones, loose escarpments, should be avoided. Climatically Tsetia is superior: warmer, lower snowfall, less exposed, lower wind speeds and longer growing season. The site is attractive in terms of wildlife viewing, canoeing and hiking. Access road from the north could have serious geotechnical problems soil failure, erosion and avalanche problems.	More detailed environmental and urban suitability site analysis required.
C. Kluayetz Camp	Environmental implications similar to the town but of lesser magnitude due to fewer people.	Similar to Kluayetz town except less area is required for camp.	More detailed environmental and urban suitability site analysis required.
D. Conclusions **1. Townsite**	Both townsites have serious implications for the environment, hence there is no clear preference.	Both sites are equally suitable as townsites. Tsetia may be superior in terms of climate. Kluayetz is closer to the mine and more central with respect to other development prospects but would suffer from closeness to the minesite.	At this time, selection of a preferred option should not be made. Further evaluation of the two sites is essential before this decision.
2. Access	Access for any option would be preferrably from the Skeena as opposed to the Klappan corridor as less area of Spatsizi Park is exposed to increased pressure from people. Hence on this criteria a Kluayetz townsite is preferred.		In addition, consideration should be given to evaluation of a site farther south at MacEvoy Flats in the Skeena drainage. Potential advantages include less impact on wildlife; more central to other coal deposits; transportation hub; close to high quality forest resource; possibly serves Sustut; likely better climate; possible reduced transportation costs; possibly better air quality.

Spatzizi Wilderness Park, the significant wildlife resources, such as moose, caribou, goat and sheep, and the potentially high heritage values are important factors in the vicinity of the minesite. The two town sites would create serious wildlife and park management problems. Each would have equally serious implications but the Tsetia town site is of greater concern because it implies an access route from the north running parallel to the park. This would place additional pressures on Spatzizi Park.

Environment/resource reviewers have suggested a third potential site for a townsite which could have a lesser environmental impact. As noted above, this location at the headquarters of the Skeena at a site called MacEvoy Flats would be preferred from a variety of social perspectives as well. Therefore, it should be given further environmental evaluation in future research.

5.2.3 Long Distance Commuting Options

A commuting scheme was not considered initially because the original production estimate involved a workforce of 1,250 persons, sufficient to support a new community. If the mine does not proceed at its full production level then a commuting option should be evaluated. In general, the environmental implications of a camp are similar to Kluayetz town except that a camp would have less severe implications as a consequence of the smaller number of people accommodated on site. Compared to the townsite options, the camp option is preferred because of the lesser environmental impact resulting from fewer people. However, as argued in section 4.4.3 above, the camp would not be a desirable option from the social perspective, except for the low production mine scenario.

5.2.4 Evaluation

It can be concluded that a new community would be preferred if the full production of 5 million tonnes is proposed. Two townsite locations have been extensively evaluated while a third has been given less extensive consideration. The first two -- Tsetia and Kluyetz -- have serious environmental implications. The former is to be preferred for climatic reasons while the latter has the advantages of proximity to the work site and centrality to other coal deposits. If a road access is provided southward through the Nass Valley rather than from the north, the Kluayetz option potentially is less environmentally destructive and is more easily accessible to the regional centres. A third possible townsite, located further south on the Skeena at a site called MacEvoy Flats, has been suggested because of the advantages of lesser environmental impact, centrality to regional transportation networks and a better location vis-a-vis forest resources.

A decision on a townsite for this project is, to a large extent, dependent on decisions on regional transportation modes and routes. A decision on a townsite location need not and should not be made now. The option of each potential townsite should be preserved and investigated in greater detail in the future.

5.3 Eaglehead, Letain and Kutcho Creek Projects

5.3.1 Options

The three projects are base metal mines of medium sizes and moderate life spans. The three mines are beyond daily commuting distance from the nearest existing community --

Dease Lake -- using conventional means of transport.* Yet combined they have a sufficiently large workforce to justify consideration of a new community. At the same time, a camp option for each mine needs to be examined given the uncertainty related to the start-up times of the individual projects, the physical isolation of the mines, the relatively short life span of the deposits and the absence of coordination between the mine companies. Consequently, both a series of camps and a new community are considered for this mine group.

5.3.2 New Community Option

A Turnagain town would serve the Kutcho Creek, Letain and Eaglehead projects. The town would experience four phases of development coinciding with the staggered starts of the three projects. Construction of the townsite and the Kutcho Creek project would begin in 1984 while the full operating workforce would arrive in 1986. The town population would grow to 1700 by 1989. Letain, the second project, would commence construction in 1987 while the operating workforce would arrive in 1990. Subsequently the town population would increase to 1900 people by 1992. Eaglehead, the third project, would commence construction in 1992 with the operating workforce arriving in 1995. The town population would peak at 2600 which would be more or less maintained until 1998 when the effects of the closure of the Kutcho Creek project would be experienced. The town population would drop to about 1500 which would be sustained until the Eaglehead and the Letain projects cease operations. Unless other economic development occurs, Turnagain potentially could become a ghost town.

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* Dease Lake is 84 kilometres (52 miles) from Eaglehead; 92 kilometres (57 miles) from Letain and 129 kilometres (80 miles from Kutcho Creek.

The required facilities are summarized in table sixteen. The level of services is not high and serious scheduling problems are created because of the fluctuations in population. Population fluctuation also adversely affects the scheduling of housing. The peak demand is estimated as follows:

social unit type	total	housing type: detached	attached	apt.	mobile
1. families	426	320	21	21	63
2. couples	220	99	22	55	45
3. singles	185	9	9	139	28
total units	831 (100%)	428 (51%)	52 (6%)	215 (26%)	136 (16%)

The capital costs for Turnagain Town are summarized in table seventeen.

From a social perspective, it has been concluded that a new community would not be as advantageous as a block time commute from an existing community for the following reasons:

- the three mines have a limited life span of 15 years hence the town ultimately would close;
- the size of the community at peak (2000 persons) is marginal in terms of supporting a level of services conducive to attracting and retaining a stable workforce;
- the prospects for an integrated housing market are minimal given the difficulties of promoting home ownership with such a short life span;
- the businessman's perception of risk would be high hence there would be difficulties in attracting private sector investment, once again diminishing the livability of the community;
- the risks of planning would be extremely high given the fact that there are three projects, each starting at different dates and with limited life spans; and
- the uncertainty and risk would mean that the public sector commitment to the town would be low and consequently the severity of the kind of social

Table Sixteen: Turnagain Town: Facilities Programme

YEAR	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995	TOTAL
POPULATION	647	1072	1407	1664	1876	1876	2199	2349	2413	2586	
facilities (in ca.):											
Elementary/ Secondary School	2166	0	0	0	0	829	0	0	0	0	2,995
Community College	0	500	0	0	0	0	0	0	0	0	500
Diagnostic Centre	0	0	0	0	250	0	0	0	0	0	250
Ambulance	0	0	0	0	150	0	0	0	0	0	150
Day Care Facilities	0	0	0	0	150	0	0	0	0	0	150
Social Agencies	0	0	0	0	100	0	0	0	0	0	100
Recreation Centre	0	3625	0	0	0	0	0	0	0	0	3,625
Commun. Pk.	8000	5400	4300	3300	3000	3000	3000	3000	3000	0	33,000
Neighb. Pk.	9300	6300	5000	3800	3800	3800	3800	3800	3800	0	35,800
Tennis (No. Courts)	2	0	0	0	0	0	0	0	0	0	2
Library	0	185	0	0	0	0	0	0	0	0	185
Municipal Hall	200	0	0	0	0	0	0	0	0	0	200
Public Works	280	0	0	0	0	0	0	0	0	0	280
Fire Protection	150	0	0	0	0	0	0	0	0	0	150
Police/RCMP	20	0	0	0	0	0	0	0	0	0	20
Retail,Office, Etc.	580	380	0	530	480	0	0	640	0	0	2,610
Hotel/Motel	520	340	270	270	0	0	0	600	0	0	2,000
Service Commercial	160	100	100	0	0	133	0	100	0	0	533
Light Industrial	1600	1100	800	0	0	800	0	500	0	0	4,800
Post Office	120	0	0	0	0	0	0	0	0	0	120
Telephone	300	0	0	0	0	0	0	0	0	0	300

Table Seventeen: Capital Costs: Turnagain Town ($000)

Social Facilities	
- public	$10,426
- private	8,414
Housing	57,447
On-Site Physical Services	11,417
Off-Site Physical Services	9,237
Commercial/Camp/Industrial Services	1,183
Planning & Development	2,444
TOTAL	$100,568

Note: All costs are in mid-1982 dollars and are order of magnitude estimates only.

problems characteristic of resource towns would be greater.

The new community, in summary, has a number of serious social implications.

The environmental implications of a Turnagain town are summarized in table eighteen. There do not appear to be serious environmental impacts or constraints which would preclude townsite development. The most serious environmental problem would be the access to the town. More detailed environmental and urban suitability analysis is required to further examine sites.

5.3.3 Long Distance Commuting Options

Two commuting schemes -- a daily commute and a block time commute -- have been examined. Both schemes would be focussed primarily on Terrace, approximately 235 nautical miles to the south:

- a daily commute involves 1.5 hours travel each way and violates the prescribed time limits;
- a block time commute would consume 1.9 hours;
- the cost per trip on a daily basis would be $31.71 per one way trip which compares favourably with that for Red Chris but is not likely to be preferred over the block time commute; and
- the cost per block time commute is $62.71 return which compares favourably with Red Chris.

The block time commute appears to be the most feasible of the two schemes.

The environmental implications of camp sites would be less severe than for a townsite. In addition the access route to the camp would be less of a concern because of the reduced number of people using it.

5.3.4 Evaluation

Three options have been considered: expansion of Dease Lake, development of a new community and institution of a block time commuting strategy. The expansion of Dease Lake has not been favoured for reasons given in section 4.2.2. The option of building a new community does not, at this preliminary level of analysis, appear to be either feasible or desirable given the sizes of the mines, their life spans, the staggered start-up dates and the inevitable closure dates. In contrast, block time commuting would:

- offer the greatest flexibility in responding to the different start-up dates of the mines;
- present the least risk for public sector planning; and
- eliminate the need to consider the problem of a short term community.

Block time commuting schemes should be given further consideration as they would offer a number of distinct advantages to a new community.

It should be emphasized that the analysis of these three mines is based on a particular development scenario which sees a sequencing of mine developments such that there is some overlap. Other scenarios are possible: the mines could start consecutively with minimal overlap; all mines could start at the same time; or the mines could start and complete operations with no continuty. The conclusions of this section could hold for the last two of the three alternate scenarios. Only in the first case -- consecutive development -- would a new community seen feasible.

5.4 Red Chris and Schaft Creek Projects

5.4.1 Options

The Schaft project is a large base metal mine (copper and molybdenum) expected to employ 1200 workers with an expected

Table Eighteen: Environmental Evaluation of Settlement Options

Letain, Eaglehead & Kutcho Creek Projects

Option	Environmental Impacts	Urban Suitability/Livability	Conclusions & Recommendations
A. Turnagain (new town)	The new town would provide access to a virtually unknown area. Potential problems identified include: possible destabilization of the sand dune areas of Turnagain lake; o probable conflict with watercourses having placer/mineral claims; potential disruption of local alpine meadows; possible wildlife problem, particularly with large predators such as bears or wolves; and possible conflict with critical fisheries habitat in Turnagain Valley. At this time, the quality and quantity of gravel supply, the recreation, aesthetic values or area, and agricultural, forestry prospects are unknown.	The proposed townsite area has several positive features, including diverse topography, several waterbodies, and mixed deciduous coniferous forests. In addition, the aesthetics, fishing, hunting, canoeing and skiing opportunities are good. The location however could be too close to asbestos and copper/molybdenum mines. Dust from these activities could cause respiratory diseases, particularly asbestosis. Specific townsite location should avoid the floodplain,steep slopes,the confluences of rivers, small lakes and avalanche hazards. Recommended sites are: - north site of Turnagain River; - south of Turnagain, Flat Creek and Ferry Creek; and, - between Flat and Ferry Creeks. Access is a major problem in terms of environmental impact.	More detailed environmental and urban suitability site analysis is required.
B. Dease Lake (existing town)	Expansion of Dease Lake will have less environmental impact than a new town at Turnagain. Access to the mines, however, would be a major problem due to the environmental sensitivity of alpine meadows, wildlife habitat, and fisheries. Possible conflicts may occur with critical fish habitat in Dease lake and the Stikine River tributaries as well as heritage sites and wildlife habitats.	Land suitable for expansion is available adjacent to the existing community however soils and topography are variable. Areas to be avoided include Dease Lake shoreline and Tanzilla River valley bottom. Access is a major problem in terms of environmental impact.	More detailed environmental and urban suitability site analysis is required, but some land adjacent to Dease Lake may be suitable.
C. Camps	The comments for the new town would apply to the individual campsites, only the environmental impacts would be less severe given the fewer number of people on site.	There would be similar implications for workcamps as for the new town only less severe. Specific comments for workcamp sites are cited below: - Letain: Locate camp away from dust generated by the mining activity. Mountainous area around King Mountain not suitable. - Eaglehead: Avalanche potential of Hard Creek Valley should be avoided. - Kutcho Creek: eastern slopes between two small lakes subject to avalanche should be avoided in favour of area further north.	A camp is clearly superior from other options in terms of the environmental impact. All workcamp site location decisions should be preceeded by survey of mineral claims and deposits as this area is of high to moderate mineral potential. More detailed environmental and urban suitability site analysis is required.

life span of 25 years. The Red Chris project, on the other hand, is a smaller mine (350 workers) with a shorter though reasonably long life of 20 years.

Neither project is located within daily commuting distance of an existing community of any significant size. Although the Red Chris project is close to Iskut and Eddontenajon (32 kilometres or 20 miles), accommodating the workforce would in effect require construction of a new community.

The Schaft project could, by itself, support a new community of reasonable size but of limited diversity. The Red Chris project would only support a very small community with extremely limited social opportunities. Their respective locations would permit consideration of one centrally located community that would provide opportunities for greater social and economic diversity. A community to serve the combined projects, however, is dependent on the ultimate transportation network.

Three possible new townsites, two potentially expanded existing communities and one camp option have been investigated. These are described below.

Kinaskan. A new community located at the south end of Kinaskan Lake and on Highway 37 could serve as a residential base for both the Schaft and Red Chris mines. Access to the Schaft property would require a road through Edziza Park a potential environmental problem. A Kinaskan community would be 64 kilometres (40 miles) from Schaft and 32 kilometres (20 miles) from Red Chris.

Bob Quinn Lake. The Schaft Project, but not the Red Chris project, could be served by a community on Highway 37 in

close proximity to Bob Quinn Lake. Access to the mine would be by road up More Creek and down the Mess Creek valleys to Schaft, a distance of approximately 77 kilometres (48 miles). One conflict is the possibility that More Creek would be flooded as part of a hydro-electric project thereby frustrating a possible road alignment.

Mess Lake. The Schaft mine could be served by a community adjacent to Mess Lake, 26 kilometres (16 miles) north of the mine. Access to the town would be from one of three directions: east to Highway 37 over Raspberry Pass, south to Bob Quinn Lake through the More Creek Valley or north down the Mess Creek Valley to Telegraph Creek.

Telegraph Creek. The Schaft Mine could be served from Telegraph Creek 71 kilometres (44 miles) to the north. What would in effect be a new town would have to be built south of the existing settlement. The social arguments against focussing development at Telegraph Creek were outlined in section 4.2.3.

Iskut/Eddontenajon. The Red Chris project, but not the Schaft project, could be served by a new community located adjacent to the existing small communities. Section 4.2.4, it will be recalled, argued against expansion of these communities essentially for social reasons.

Camp. The Red Chris mine could, if not accommodated as part of a Kinaskan town, become part of a block time commute scheme using Terrace as the originating community.

Each option will be discussed in greater detail in the following subsections.

5.4.2 New Community Options

A Kinaskan town, serving both Schaft Creek and Red Chris projects, would likely be a larger community than would result from other site options. The town would experience two phases of development beginning with the construction of Red Chris in 1987 and commencement of operations in 1990. The second phase of development would coincide with commencement of construction of Schaft Creek in 1989 and of operations in 1992. The town population would grow from approximately 300 in 1989, to 1990 in 1991, and peak at 3700 in 1992.

Mess Lake, Bob Quinn Lake, and Telegraph Creek are alternate sites but only for the Schaft Creek Mine workforce. A smaller, single enterprise town would result from selection of one of these alternates. The Schaft Creek Mine could begin construction in 1989 with operations commencing in 1991. The population of the town would increase from 775 in 1989 to a peak population of 2800 in 1991.

Table nineteen presents the facilities schedule for a Kinaskan Town and table twenty for a Bob Quinn/Mess Lake/Telegraph Creek Town. The town alternatives are similar in their facility complement although Kinaskan is somewhat better serviced, being a larger community than the other three. The housing demand would be as follows:

a. Kinaskan Town

social unit type	total	housing type			
		detached	attached	apt.	mobile
1. families	651	488	33	33	98
2. couples	680	306	68	170	136
3. singles	557	28	28	418	48
total units	1888 (100%)	822 (43%)	129 (7%)	621 (33%)	282 (17%)

Table Nineteen: Kinaskan Town: Facilities Programme

YEAR	1989	1990	1991	1992	1993	1994	1995	1996	1997	TOTAL
POPULATION	288	873	1878	3663	3663	3663	3663	3663	3663	
FACILITIES (in ca):										
Elementary/ Secondary School	0	3710	0	0	0	0	0	0	0	3710
Community College	0	0	500	0	0	0	0	0	0	500
Diagnostic Centre	0	0	250	150	0	0	0	0	0	400
Ambulance	0	0	150	0	0	0	0	0	0	150
Day Care Facilities	0	150	0	0	0	0	0	0	0	150
Social Agencies	0	100	0	50	0	0	0	0	0	150
Recreation Centre	0	0	3,625	0	0	0	0	0	0	3,625
Commun. Pk.	0	11,000	13,000	11,000	11,000	0	0	0	0	46,000
Neighb. Pk.	0	12,500	14,500	13,000	13,000	0	0	0	0	53,000
Tennis (No. Courts)	0	2	0	0	0	0	0	0	0	2
Library	0	0	185	0	0	0	0	0	0	185
Municipal Hall	0	200	0	0	0	0	0	0	0	200
Public Works	0	280	0	0	0	0	0	0	0	280
Fire Protection	0	150	0	0	0	0	0	0	0	150
Police/PCMP	0	20	0	0	0	0	0	0	0	20
Retail, Office, Etc.	0	800	900	800	800	0	0	0	0	3,300
Hotel/Motel	0	700	800	700	700	0	0	0	0	2,900
Service Commercial	0	218	250	250	250	0	0	0	0	968
Light Industrial	0	2,100	1,009	890	890	0	0	0	0	4,900
Post Office	0	120	0	0	0	0	0	0	0	120
Telephone	0	500	0	0	0	0	0	0	0	500

Table Twenty: Mess/Bob Quinn Lake/Telegraph Creek Town: Facilities Programme

YEAP	1989	1990	1991	1992	1993	1994	1995	1996	1997	TOTAL
POPULATION	775	2052	2814	2814	2814	2814	2814	2814	2814	
FACILITIES (in ca):										
Elementary / Secondary School	2995	0	0	0	0	0	0	0	0	2995
Community College	0	0	500	0	0	0	0	0	0	500
Diagnostic Centre	0	250	0	0	0	0	0	0	0	250
Ambulance	0	150	0	0	0	0	0	0	0	150
Day Care Facilities	0	250	0	0	0	0	0	0	0	250
Social Agencies	0	150	0	0	0	0	0	0	0	100
Recreation Centre	0	0	3,625	0	0	0	0	0	0	3,625
Commun. Pk.	9,000	9,000	9,000	9,000	0	0	0	0	0	36,000
Neighb. Pk.	10,000	10,000	10,000	10,000	0	0	0	0	0	40,000
Tennis (No. Courts)	2	0	0	0	0	0	0	0	0	2
Library	0	0	185	0	0	0	0	0	0	185
Municipal Hall	200	0	0	0	0	0	0	0	0	200
Public Works	280	0	0	0	0	0	0	0	0	280
Fire Protection	150	0	0	0	0	0	0	0	0	150
Police/PCMP	20	0	0	0	0	0	0	0	0	20
Retail, Office, Etc.	700	1,146	690	0	0	0	0	0	0	2,536
Hotel/Motel	560	1,080	610	0	0	0	0	0	0	2,250
Service Commercial	194	320	190	0	0	0	0	0	0	704
Light Industrial	1,900	3,200	1,900	0	0	0	0	0	0	7,000
Post Office	0	120	0	0	0	0	0	0	0	120
Telephone	0	300	0	0	0	0	0	0	0	300

b. Mess Lake/Bob Quinn Lake/Telegraph Creek Town

social unit type	total	housing types			
		detached	attached	apt.	mobile
1. families	432	324	22	22	66
2. couples	360	162	36	40	72
3. singles	307	15	15	230	45
total units	1099 (100%)	501 (46%)	73 (7%)	292 (27%)	183 (17%)

Tables twenty-one and twenty-two summarize the capital costs for the Kinaskan and Mess Creek/Bob Quinn Lake/Telegraph Creek townsite options.

From a social perspective, the settlement options ranked in order of preference are Kinaskan, Bob Quinn Lake, Mess Lake and Telegraph Creek. Kinaskan, the most preferred option, has several desirable features. It can:

- serve more than one mine, is larger in size and would have a more diversified employment base;
- support a greater array and extent of public services/facilities and commercial services due to a larger size;
- through its location in a high quality tourist area and its centrality to harvestable forest resources, offer the best prospects for an economically, socially and politically diversified community; and
- due to its central location on Highway 37, be accessible to other resource areas and the regional centres on Highway 16.

The major disadvantages of Kinaskan are the possible difficulties in providing access through Raspberry Pass to Schaft Creek as well as the environmental problems associated with the road itself. The second preference would be Bob Quinn Lake. Although it does not have the size and immediate diversification possibilities of Kinaskan it

Table Twenty-One: Capital Costs: Kinaskan Town ($000)

Social Facilities	
- public	$12,376
- private	9,415
Housing	121,965
On-Site Physical Services	23,841
Off-Site Physical Services	12,141
Commercial/Camp/Industrial	1,675
Planning & Development	3,462
TOTAL	$184,875

Note: All costs are in mid-1982 dollars and are order of magnitude estimates only.

Table Twenty-Two: Capital Costs: Mess Creek/Bob Quinn Lake/ Telegraph Creek Town ($000)

Social Facilities	
- public	$11,078
- private	8,147
Housing	71,097
On-Site Physical Services	14,775
Off-Site Physical Services	9,327
Commercial/Camp/Industrial	1,287
Planning & Development	2,659
TOTAL	$118,371

Note: All costs are in mid-1982 dollars and are order of magnitude estimates only.

occupies a strategic location on Highway 37. It, however, cannot serve the Red Chris project and the daily commute through More Creek pass may be questionable in the winter.

The third preference, Mess Creek, has only the advantage of proximity to the mine, hence a reduced commuting time. In social terms it is desirable only if favourable access cannot be provided to the Kinaskan or Bob Quinn sites. The expansion of Telegraph Creek to serve Schaft or Iskut/ Eddontenajon to serve Red Chris are not favoured due to the negative social consequences of radical community change (section 4.2.4).

Each option has significant environmental implications arising not so much from the development of the town itself but from the problems with access routes from the town to the mine (table twenty-three). Of particular concern are the environmental resources of Edziza Park. Improved access to the park and its environs would have the following implications:

- the park is of national significance with extremely sensitive environmental features: volcanic cones, lava beds, etc.;
- the proposed Raspberry Pass access route parallels a prehistoric migration route as well as the Old Telegraph Trail hence many heritage resource impacts are expected;
- major park management problems would be created requiring increased staff, budget and regulation; and
- wildlife resources are heavily concentrated in the park and its environs hence would likely be affected.

Each site would experience the effect of these concerns although in varying degrees. In order of acceptability, Bob Quinn Lake with a More Creek access would be preferred, followed by Mess Lake, if it involved a More Creek access. Kinaskan is least preferred because of the necessity of a Raspberry Pass Road to access the Schaft Creek mine.

In terms of the environmental implications of the townsites themselves, each has certain environmental sensitivities but these would seem to be managable. The Mess Lake Town would have the most significant localized effects due to its closeness to Edziza Park, the presence of wildlife and the possibility for alienating mineral and geothermal resources.

In terms of urban suitability all four sites are attractive. Kinaskan, however, is more preferred because of its centrality on Highway 37, its tourism possibilities, its high aesthetic and recreational attractiveness and its benign climate. The second preference would be Bob Quinn Lake which has superior location, climate and site suitability qualities than the remaining options.

5.4.3 Long Distance Commuting Options

If the Kinaskan town is not feasible then consideration needs to be given to other options for the Red Chris project. In particular, the potential of a commuting option for Red Chris should be reviewed.

The potentials of both a daily and a block time (seven days on/seven days off) air commute focussed on Terrace, 196 nautical miles to the south, have been examined:

- the daily air commute would take 1.4 hours each way and would violate the daily time constraint of 45 minutes;
- the block time commute would take 1.7 hours, well within the prescribed limits. As such it is the second most attractive scheme considered;
- the daily commute would cost $27.75 per one-way trip, which would be a high price to pay; and
- the block time commute would cost $57.73 return and is the second most attractive scheme of all those considered.

The environmental implications of a camp at Red Chris are serious but are manageable with sensitive site planning and design.

Table Twenty-three: Environmental Evaluation of Settlement Options

Red Chris Copper, Schaft Creek Molybdenum Project

Option	Environmental Impacts	Urban Suitability/Livability	Conclusions & Recommendations
RED CHRIS			
A. Camp	Area has high resource values including: mineral potential, wilderness, recreation and wildlife. The plateau southwest of the deposit is a goat and sheep habitat. It also has mineral occurences and should be avoided. One possible location is 30km northeast of Kluca Lake: low elevation valley, close access.	Potentially limiting factors are: problems with shallow soils; prolonged periods of high winds and need to avoid fugitive dust. Opportunities are moderate precipitation, aesthetics and recreation values.	More detailed environmental and urban suitability site analysis is required.
B. Kinaskan	The environmental implications of the town-site itself are not serious however it implies a Raspberry Pass road which has the following implications: - park management efforts would need to be increased to protect significant landscape; - wildlife resources would be seriously affected; and - high density heritage sites likely would be impacted in terms of pre-historic and historic (Telegraph Trail) resources.	Site conditions are favourable in terms of soils. A high quality site: it has good solar aspect, views, lake based recreation, hiking and hunting possibilities. Its location on Highway 37, proximity to forest resources, tourism potential and possibilities of housing Red Chris site are also in its favour.	The site and location appear to be good. A policy decision is necessary on the Raspberry Pass road. If the road is not built this option is not feasible.
C. Iskut/Eddontenajon	The development of site would not appear to have environmental impacts which cannot be mitigated through sensitive site planning particularly with respect to the Lake.	Sufficient suitable land is available. Careful attention to potential avalanche on west slopes, floodplain and lakeshore required. The site is attractive in terms of views, aspect and water based recreation.	The sites are not as good as others in the same corridor in terms of environmental impact or urban suitability/livability.
SCHAFT CREEK			
A. Camp	Existing data indicates resource values in this area with exception of wildlife are not as significant as other areas.	Difficult climate in this area, possible flooding problems. Some aesthetic and recreaction values.	This area may be suitable for a camp from the perspective of environmental impact, but has urban suitability problems. Further study on environmental impact and urban suitability is required before a decision is made.

Table Twenty-three: Environmental Evaluation of Settlement Options

Red Chris Copper, Schaft Creek Molybdenum Project
(continued)

Option	Environmental Impacts	Urban Suitability/Livability	Conclusions & recommendations
B. Kinaskin (Expansion)	Same as Red Chris " B" above.	Same as Red Chris "B" above.	Same as Red Chris "B" above.
C. Telegraph Creek (Expansion)	The major concerns would be: lose of agricultural land; pressure on fishery resource; impact on heritage resources, wildlife resources (moose) and Edziza Park. Access is major concern in this regard.	Suitable land available however it is necessary to avoid steep canyons and agricultural land. Climate is extremely favourable. Snow avalanche potential evident.	More detailed environmental and urban suitability analysis is required.
D. Bob Quinn Lake	The development of this site would not appear to have environmental impacts which cannot be mitigated through sensitive site planning. The access route along More Creek would be the most serious concern in terms of the increased pressure on Edziza Park however the impact would likely be less than for "A", "B" & "C".	Site conditions are favourable. Serious hazard areas in particular steep slopes to east capable of mass slippage and avalanche should be avoided. The site is attractive in terms of views, water supply, water based recreation and hunting. The location on Highway 37 is favourable.	The location and site are good. The More Creek access route may conflict with hydro possibilities. Further environmental and urban suitability analysis required.
E. Mess Lake Town	Environmental impact could be severe due to proximity to Edziza Park; impact on aesthetics, wildlife resources and heritage resources both within park and through river valleys. Access route either up Mess Creek or Raspberry Pass major concern, particularly the latter.	Suitable land available. Townsite development would have to avoid geothermal springs, mineral deposits, potential avalanches and floodplains. Positive features of site include mountain aspect and wildlife. The climate is colder, wetter and has deeper snow than other alternatives.	The site is closer to the mine than other sites but is climatically less attractive, more isolated in location. Further environmental and urban suitability analysis required.
Conclusions	Existing data indicates that resource impacts will result from all options however camp proposals will have less impact than townsites because fewer people involved.	All options have some suitability problems, but none are so severe as to eliminate options at this time.	All options need further environmental and urban suitability analysis before settlement options are selected.

5.4.4 Evaluation

The selection of a preferred option for the Red Chris/Schaft projects is the most difficult and complex of all the settlement option questions considered in this analysis. A decision on a preliminary option has to balance social, environmental, financial and transportation criteria. The tentative, summary evaluation of the options is illustrated in figure ten. It should be emphasized that these are tentative and relative rankings based on extremely limited information. The specific evaluation is summarized in the following paragraphs.

Bob Quinn Lake. This is the preferred option from an environmental perspective. It would have the least impact on Edziza Park. Although not as attractive socially as Kinaskan it is more central to the region, less isolated and more accessible to southern regional centres than the other sites. However, it is dependent upon a good, all-weather access route through More Creek valley to Schaft Creek. This may or may not be feasible depending on whether More Creek is developed as a hydro-electric generating source and whether a road can be accommodated alongside a reservoir. If a road is not feasible, if travel times are beyond daily limits or if travel is unreliable then other options would have to be considered.

Kinaskan. Kinaskan is the preferred settlement option from a social perspective. It can accommodate Red Chris mine employees, hence is potentially a larger, more diversified community. In addition, it has good tourism and forestry development potential as well as being an extremely attractive site for settlement. The principal constraint is the possible environmental disruption associated with the construction of the preferred access road through Raspberry Pass located in Edziza Park. This road would increase traffic to the park -- a negative feature if one considers

Figure Ten: Summary Evaluation of Options for the Schaft Creek and Red Chris Projects

		EVALUATION FOCUS			
PROJECT	OPTION	SETTLEMENT	ENVIRONMENTAL	TRANSPORTATION	SOCIAL
SCHAFT & RED CHRIS	KINASKAN	very good	poor	good	good
SCHAFT ONLY	BOB QUINN	good	good	fair	good
	MESS LAKE	fair	fair	not dependent on transport	poor
	TELEGRAPH	poor	fair	poor	poor
RED CHRIS ONLY	ISKUT/ EDDONTENAJON	poor	good	good	poor
	CAMP	good	fair	good	good

the park a pristine environment. Some view a road as a positive feature, as it allows more people to enjoy the park experience. Kinaskan should be built if the environmental implications of the Raspberry Pass access route are resolved, if construction is feasible both technically and financially and if travel times are within suggested parameters.

Mess Lake. A Mess Lake town would have the advantage of minimum travel time. It would be the preferred option only if access and/or travel times to Kinaskan or Bob Quinn Lake sites were to prove unacceptable.

Telegraph Creek. A Telegraph Creek new town is not an attractive option in comparison to the other options. It should only be considered if road access is provided from the north.

Iskut/Eddontenajon. Expansion of these communities to accommodate the Red Chris project is not favoured due to the undesirable social consequences.

Camp. A camp is the preferred option for Red Chris project. A camp option was not considered for the Schaft Creek project because the workforce size is sufficient to warrant construction of a new community.

In conclusion, a number of options have been developed. Detailed information particularly relating to environmental features is limited, but a tentative ranking of preferences can be made. Decisions on options are interwoven with decisions related to the transportation route and the energy supply options. A decision on a preferred option is neither required nor desirable. All options should be kept open and be given further evaluation in the future.

5.5 Stikine Project

5.5.1 Options

The Stikine Copper project is a medium sized project (450 employees) with a 20 year life span. It is the most isolated and the most difficult to access of all the projects considered. It is also the most uncertain in terms of proceeding because of the significant lapse of time before the projected operating date. The question of developing a range of settlement options suitable for further evaluation proved difficult particularly because of problems in ascertaining the likely transportation access for this project. Following is a summary of the transportation problems:

- Road: Access by road whether through Alaska or Highway 37 via the Stikine would be circuitous, difficult and expensive to construct particularly if a tunnel is required;
- Tunnel: Access would be shorter and more direct if a tunnel were drilled through from the Mess Creek Valley (Schaft Creek). However, the costs are likely to be prohibitive;
- Barge: Access may be possible using barges up the Stikine through Alaska, but this will require international negotiations; and
- Air: Air access is feasible. Yet because of difficult terrain, construction of an airport near the mine would be difficult. Consequently considerable distance still would have to be traversed between the airport and the mine site.

Any prognosis on options at this point is very risky. It is believed, however, that the most feasible option would be a camp. Potential townsites have been identified by the company (Hudsons Bay Mining and Smelting). A new community to serve this project alone would be very small, poorly serviced and very isolated. Utilization of the town serving the Schaft project may be feasible if a tunnel is constructed to connect the two valleys.

5.5.2 Long Distance Commuting Options

The commute option was evaluated both for daily and block time (seven days on/seven days off) commuting from Terrace, 193 nautical miles to the south. The major difficulty with both commuting schemes is the fact that the mine would be located some distance from potential airport sites, possibly necessitating a helicopter shuttle service between the airstrip and the mine. The implications of this are as follows:

- both tne daily and the block time commute violate the criteria for acceptable travel time. Of all the commuting schemes analysed, this is the only scheme to do so; and
- the costs of the schemes are the highest of all schemes investigated in terms of total costs per seat, but only because of the shuttle. The actual air costs are the second most preferable of the schemes considered on both a daily and block time basis.

If the shuttle problem were resolved the project could be feasible using a block time commuting scheme.

The environmental implications of a Stikine camp are summarized in table twenty-four. While information is scarce it has been concluded that a camp option is preferred to a new town. It is unlikely, however, that environmental and site conditions will preclude the possibility of a new town.

5.5.3 Evaluation

The Stikine project is difficult to evaluate due to the numerous uncertainties it is experiencing. Further intelligence is needed in connection with transportation route and mode alternatives before even a preliminary consideration of settlement options can occur. Specifically, the following transportation access possibilities need investigation:

- road access from Bob Quinn via the Iskut and Stikine valleys;
- tunnel access via the Mess Creek valley;
- barge access up the Stikine through Alaska; and
- air access from Stewart, Prince Rupert and Terrace.

Once the uncertainty with respect to the transportation network is resolved, further consideration should be given to the possibilities of either a new community in the Stikine Valley, commuting via a tunnel from a town which could also serve the Schaft project, or a block time air commute from the southern centres.

Table Twenty-four: Environmental Evaluation of Settlement Options

Stikine Copper

Option	Environmental Impacts	Urban Suitability/Livability	Conclusions & Recommendations
STIKINE COPPER PROJECT A. Camp	Wildlife resources in Scud valley are likely to be impacted. Mineral values in area are high. Areas of ongoing exploration should be avoided.	Area has suitability problems relating to harsh climate, avalanche potential and water supply difficulties. Plateau at confluence of Gralene and Scud Rivers should be avoided. Recreation and aesthetics are favourable.	More detailed environmental and urban suitability analysis is required. A site on the east side of the Stikine River near the mouth of the Scud River just north of the Porcupine River should be be considered as this could serve as base for other resources and has good climate and topography
Conclusions	Existing data indicates there will be resource impacts from the camp options.	Topography and other urban suitability factors preclude a townsite option.	Further environmental and urban suitability analysis is needed.

6.0 A SETTLEMENT STRATEGY FOR THE NORTHWEST: A FRAMEWORK FOR DECISIONS

The previous chapter developed a set of settlement options to serve each of the proposed mines or mine groups and then evaluated each option as to its implications. This chapter summarizes what is known with respect to the various settlement options for the Northwest, focussing on the generic settlement types -- sponsored versus unsponsored commuting from an existing versus a new town -- rather than particular mines. It sets out a strategy or framework to guide or to direct settlement decisions with respect to the development of the Northwest region. In this regard, it needs to be emphasized that settlement is responsive to economic development and not vice-versa. In a region like the Northwest, whose economy is essentially resource based, the function of a settlement strategy is to respond to resource development both efficiently and equitably. A settlement strategy for the Northwest therefore cannot and should not be a **master plan** which specifies future directions for settlement in the region; rather it should provide a **framework** of objectives and policies for directing the development of the region. This is a critical point and deserves further elaboration.

It will be recalled from chapter 3.0 that the analytical framework is based on the Ministry's "Resource Community Planning: A Framework for Choosing Settlement Options". It has three stages: developing settlement options, choosing settlement options and securing settlement options.
The approach of this paper generally follows the framework, however, with one important exception. The choice step is not given much attention as a consequence of there not being a concrete development or concrete set of participants who

are able to express their preferences. Chapters four and five developed a range of settlement options and analyzed their implications in terms of population, service demand, finance, social and environmental impacts. The analysis compares the various options for each mine group but stops short of choosing a particular option. It is not necessary nor is it desirable to make choices at this point. It is possible and desirable, however, to provide a framework for choosing options and securing options which can provide guidance to prospective developers, reduce uncertainty and direct decisions on further work involving policy clarification, research, discussion and specific site investigations. In conclusion, while choosing settlement options is in many respects given short shrift in this paper, the process of securing options -- no matter what they may be -- can be given major attention.

Chapter 6.0 is organized as follows. Section 6.1 summarizes the discussion of settlement options organized by generic settlement option rather than by mine group. Section 6.2 briefly reviews the process of choosing settlement options. Section 6.3 is a major section which outlines the process of discussion and negotiation leading to agreement between the Province, local government and resource companies on implementation of the preferred settlement option. In this regard, it discusses the need for a comprehensive development agreement, (6.3.1) fair sharing of risks and costs (6.3.2) and the organization and management of settlements (6.3.3.).

6.1 Settlement Options for the Northwest

Chapter 3.2, it will be recalled, suggested four logical generic settlement options which concern the means by which

the resource company's workforce is housed, provided with community services and transported to the workplace. These are:

- sponsored, extra-regional commute from an existing town;
- sponsored, intra-regional commute from an existing town;
- unsponsored, intra-regional commute from an existing town; and
- unsponsored or sponsored, intra-regional commute from a new town.

The following sections examine each of these generic options. More specifically it discusses:

- long distance sponsored commuting from existing regional centres in the southern zone;
- long distance sponsored commuting from existing communities in the northern zone;
- unsponsored commuting from existing communities; and
- new towns in the northern zone.

The table below summarizes the relationship between the analytical framework, the options for the Northwest and the structure of section 6.1.

Organization of section in context of generic settlement options

Type of town / Type of commute	Extra-regional		Intra-regional	
	New Town	Existing Town	New Town	Existing Town
Sponsored Commute	--	6.1.1	6.1.4	6.1.2
Unsponsored Commute	--	--	6.1.4	6.1.3

6.1.1 Participation of Existing Regional Centres in the Southern Zone: Long Distance Commuting

Existing regional centres are not well situated to serve as residential bases for daily commuting to proposed mine developments. These centres -- Smithers, the Hazeltons, Terrace, Kitimat, Prince Rupert/Port Edward and Stewart -- will none-the-less play a critical regional development support role by providing a wide range of public and private services in support of resource development. Further participation is dependent on the desirability and feasibility of an alternative commuting scheme to proposed mine developments.

Long distance sponsored extra-regional commuting from existing communities is an attractive option for responding to resource developments in the Northwest (see section 4.3.8). Potentially it can provide a bridge between the well developed, settled southern zone with the less developed, sparsely settled northern zone. It also can provide a bridge between the existing residents and new residents through provision of employment opportunities. Long distance block time commuting schemes provide an effective tool for five tasks:

- avoiding development of small, single resource, single enterprise communities with their attendant problems;
- utilizing the social and economic advantages of existing communities with their extensive services, employment opportunities and well established networks of social institutions and associations;
- providing existing residents with the opportunity to participate in development of the region without leaving their homes;
- securing a stable workforce for remote industrial operations; and
- diversifying the economic base of southern communities.

While the desirability of commuting is clear, there are still a number of questions relating to feasibility. The six mines that are the most appropriate candidates for a commuting scheme are Red Chris, Stikine, Eaglehead, Letain, Kutcho Creek and Sustut. A technical and financial evaluation of each of these proposed commuting schemes has been undertaken, but a decision at this point on pursuing this option for the suggested mines would be premature. Discussion has to take place and a number of technical questions still need to be answered before a commuting scheme could be considered feasible. The discussions should focus on:

- the acceptability of a commuting scheme by particular companies given the need to place long distance commuting in the context of the total financial and operating picture of the particular mine;
- the receptivity of residents of existing regional centres in the southern zone to participation in a commuting scheme; and
- the interests of air carriers in being involved in such schemes.

Technical investigations should be initiated to examine the following:

- the availability of suitable airports with the requisite operating characteristics;
- the reliability of air travel between suggested origins and destinations;
- the social impact of block time commuting on the worker, the worker's family, the native community and industrial productivity; and
- the environmental impact and development suitability of potential camp or air field sites, particularly where a camp may serve more than one mine site.

These discussions and technical investigations would have value for both the short term and long term development of the region.

With respect to commuting preferences a commuting scheme could be established in any of a number of southern centres. No preference has been stated; each of the

communities is eligible and each has to be looked at in more detail. In fact it is a desirable objective that individuals in each of the communities have the opportunity to participate in a commuting scheme. The selection of a particular centre as a focus for a commuting scheme is dependent on further analysis of that community's capability to accommodate a scheme, the interests and wishes of local residents and the preferences of the resource companies. At the same time it is worthwhile, at this point, to address the particular community development problems of individual communities which may act as constraints to the future implementation of a commuting proposal. In this regard the following community and/or regional problems should be examined:

- resolution of the serious local government structure problem in the Terrace urban fringe;
- examination of the financial capacity of Terrace; and
- review of local government structure problems in the Hazelton area.

In addition to these problems, a number of generic policy issues have been identified that have implications for the development of a southern, sponsored commuting scheme. These are the following:

- taxation of remote industrial operations by the host community;
- difficulties in negotiation of development agreements with more than one company and/or community;
- approaches to co-ordination of planning and service provision between communities to ensure that community services are not over-provided or under-provided;
- evaluation of the social implications of commuting for existing communities, focussing on the impact resulting from the absence of the prime wage earner for long periods of time on community leadership and voluntary associations.

Examination of these policy issues would better prepare the Province and local communities to deal effectively with the possible introduction of block time commuting schemes.

6.1.2 Participation of Existing Communities in the Northern Zone: Long Distance Commuting

The pattern of settlement in the Northern Zone is not well developed, paralleling the state of the regional economy. The overall population is small and thinly scattered. The level of services is low; current economic opportunities are limited; and local government structures are almost totally absent. The proposed resource developments would seem to offer the potential for positive change, particularly in terms of employment. The level of development proposed, however, would create radical or fundamental change in the structure of communities in the northern region. While no definitive survey of residents has been undertaken, preliminary analysis indicates a wide variety of opinions arising from desire for growth, concern about growth and resistence to growth. It is believed that change likely would be welcomed if it provides social opportunities for existing residents, is well managed and involves residents in making decisions about their communities. In this regard, the lack of local government institutions in the region is a major impediment to initiating dialogue on development of the region. Furthermore, the lack of definitive information on the social adaptability of local communities serves to reinforce the concern regarding lack of local representation.

With respect to the proposed mine developments existing northern zone communities -- Iskut/Eddontenajon, Telegraph Creek, Dease Lake and Cassiar -- are not well situated vis-a-vis proposed mines to enable commuting on a daily basis by mine employees. Furthermore, the communities lack the social infrastructure to ensure that efficient and equitable expansion takes place. The designation of

existing communities as the focii for growth would likely have a heavy social cost. At the same time, residents who are unemployed or under-employed should have the opportunity to participate in potential mine developments if they so choose.

The development of long distance, sponsored, block time commuting would provide existing residents with an opportunity to participate in potential developments. It would potentially provide a number of benefits:

- residents could choose to participate in development or not;
- the economic bases of existing settlements would be supplemented;
- the positive social attributes of existing settlements would be protected from undue disruption; and
- the resource industry could secure a stable workforce.

The feasibility of implementation is dependent on resolution of a number of issues:

- the acceptability of a commuting scheme by particular companies given the need to place long distance commuting in the context of the total financial and operating picture of the particular mine;
- the receptivity of residents of existing community centres in the northern zone to participation in a commuting scheme;
- the interests of air carriers in being involved in such schemes;
- the availability of suitable airports with the requisite operating characteristics;
- the reliability of air travel between suggested origins and destinations;
- the social impact of block time commuting on the worker, the worker's family, the native community and industrial productivity; and
- the environmental impact and development suitability of potential camp or air field sites, particularly where a camp may serve more than one mine site.

These issues need to be examined to determine definitively the feasibility of a commuting scheme.

With respect to preferences, none has been stated. Again, each community is eligible and each has to be looked at. While no preference is stated it is worthwhile to address the particular community development problems in the region which may act as constraints to implementation of a commuting scheme. In this regard the following are of note:

- provision of the opportunity for local residents to participate in decisions regarding the development of the region;
- consideration of the possibility of residents of existing communities being provided with local self-government;
- further assessment of the adaptability of existing communities to change;
- initiation of discussions with prospective resource developers to determine interest in commuting schemes;
- determination of both the level of skills and the interest of local residents with respect to mine employment;
- resolution of persistent Crown land allocation problems;
- continued discussions with Native communities;
- continued effort at increasing the level of planning evident in local communities; and
- resolution of the question of local self-government for Cassiar.

Actions on these issues would place existing communities in the region in a stronger position to deal effectively with current and anticipated change. As a consequence they would be better prepared for potential participation in commuting schemes.

6.1.3 Participation of Existing Communities in the Northern Zone: Unsponsored Intra-Regional Commuting

Unsponsored commuting involves workers commuting to work sites completely at their expense from existing communities. It has been indicated that unsponsored commuting from existing northern communities is not likely to be substantial, given the distance of existing communities from proposed developments, the costs of

commuting and the time consumed. At the same time current residents should be given the opportunity to commute at their own expense, work at the mine site and receive all of the benefits of mine employment, including housing subsidies. The one significant exception to this pattern is the Red Chris mine which is in relatively close proximity to Iskut/Eddontenajon. In this case, careful planning is necessary to avoid undue social disruption of the community.

6.1.4 New Communities

Although the bias in provincial settlement policy is towards existing settlements, it is recognized that new communities may be necessary if workforce size, commuting distance and the attractiveness of existing communities work against a commuting scheme. Conversely a new town may, by virtue of its size, attain an attractiveness equal to or greater than existing communities. In the Northern Zone of the Northwest region preliminary analysis indicates that two and possibly three projects are deserving of consideration for establishment of new communities. These are the Schaft Creek, Red Chris and Klappan Coal projects. A total of five alternative sites have been evaluated for Schaft Creek/Red Chris and three sites for Klappan. In addition, it should be noted that the Letain, Eaglehead, and Kutcho Creek projects have been examined as to the desirability of a new town. It has been concluded that they must resolve their problems with sequencing if a new community is to be a viable option.

It should be noted that commuting from a new community to the work site can be sponsored or unsponsored. In the context of the discussion of new town development it is not a critical point.

The decision on whether and where to build new communities to serve these projects cannot, need not and should not be made at this time. Additional analysis is required and the preferences of the companies have to be considered. Furthermore, decisions on townsites are subordinate to larger provincial decisions on development of the region. Provincial decisions on the following will have major implications for decisions on new town options.

Regional development. The Schaft and Klappan projects will require a major involvement in regional infrastructure: new highways, railways and energy supplies are needed to support these projects. If a new community were built, it would be part of a larger decision on regional development.

Environmental protection. The proposed projects are located in close proximity to two nationally significant, highly sensitive provincial parks. Schaft is adjacent to Edziza Park while Klappan is adjacent to Spatsizi Park. A provincial decision will be necessary on a management philosophy for these parks. This philosophy must consider the degree of disruption that can be tolerated and still retain the wilderness qualities of these parks. The decision will partially determine whether or not a town should be built. It would determine also where a town is built. Some townsites which are favourable socially could be ruled out in favour of the least environmentally disruptive alternative. For example, the socially favourable Kinaskan townsite could be rejected in favour of the environmentally favourable Bob Quinn Lake townsite.

Transportation corridors. The decision on location of towns for both projects is intimately connected with decisions on transportation routes. A Kinaskan town requires access

through Raspberry Pass whereas Bob Quinn Lake requires access through More Creek Valley. A Tsetia town for Klappan would have road access from the north whereas a Kluayetz town is best accessed from the south. A MacEvoy Flats town requires access from another corridor. Transportation decisions again involve environmental considerations.

Energy. There are three possible approaches to the supply of energy to this region -- the extension of the existing electrical transmission grid, development of thermal coal generation and small scale hydro-electric projects. More Creek is a highly valued hydro site which if utilized may preclude road access through the More Creek Valley to connect the Schaft project with a Bob Quinn Lake town.

Clearly, a decision on townsite options cannot be made today. If a decision is made to proceed with one or more of the projects requiring a new town then a decision on building a new community should be preceded by:

- confirmation of provincial decisions on access, energy and the degree of environmental disruption that can be tolerated;
- full evaluation of reasonable settlement options;
- extensive environmental/urban suitability analysis of alternative sites;
- full scale municipal financial analysis and discussions on cost sharing;
- a commitment by both the Province and the resource company to mitigate social costs; and
- a full investigation of regional development possibilities in addition to mining.

In short, new town development is a complex and demanding exercise requiring a commitment to plan by both the Province and the resource companies.

6.2 Choosing Settlement Options in the Northwest

The choice of settlement options for each project has not been made and should not be made at this time. The

Ministry's report, "Resource Community Planning: A Framework for Choosing Settlement Options" [MMA 1979], outlines criteria for choosing options and the process of making a choice. If there is consensus on the settlement issue by the company, the existing communities and the Province, then the response is straight-forward. But consensus is usually difficult to achieve, for the following reasons:

- there are competing interests that cannot all be fully satisfied, hence trade-offs are necessary;
- no formula or mathematical equation can resolve the interests of each party;
- each party values the factors influencing options differently; and
- the criteria used to select options are often in conflict.

Consequently choices have to be made. The "Framework for Choosing Settlement Options" outlined seven different but inter-related approaches to choosing options. These are:

- least social cost: the costs to society as a whole should be minimized;
- least public cost: financial expenditures by the public sector should be minimized;
- greatest manageability: the ease of implementation should be maximized;
- greatest social welfare: the net benefits of growth to society should be maximized;
- least risk/uncertainty: the risk to the public sector should be commensurate with the anticipated benefits;
- greatest future benefits: the future value of benefits should be maximized; and
- most equitable distribution of benefits/costs: the ratio of costs to benefits received within each group should be proportionate between groups.

These seven criteria can be used in making choices. They are not mutually exclusive. A choice ultimately must be made on what criterion to emphasize, but the decision does not have to be made at this time.

6.3 Securing Settlement Options for the Northwest

A rich array of options exist to serve resource developments in the region both the Province and the resource companies need to do further homework before decisions have to be made. In the interim, both parties will be working towards securing agreement on development of the Northwest. This section outlines the process of discussion and negotiation between the public and private sectors leading to a development agreement. It also describes some of the financial and organizational policy precedents which provide direction as to likely principles to be applied in the Northwest.

6.3.1 Public and Private Sector Negotiation: The Need for a Comprehensive Agreement

Both the public and private sectors have an interest in efficiently securing agreement on the approach to resource development in the region. Both parties need to be committed to plan and in order to plan, information is needed. Following is the framework for the sharing of information and the initiation of planning in the Northwest:

- the Northwest Economic Development Strategy can provide a framework of provincial objectives and policies to guide development decisions. Further planning work by the Province would ensure that this framework is increasingly clarified and where necessary expanded.
- private sector resource developers can continue to plan for the ultimate development of their properties relying to a large extent on a context created by the framework of objectives and policies provided by the Province.
- the provincial Guidelines for Coal Development and Guidelines for Metal Mine Development provide a process whereby individual mine developers submit information to the Province in order to assist its planning.
- At the same time developers have the opportunity to receive feedback from the Province on company proposals. In particular, review of company preferences for

settlement options can take place in the context of Provincial objectives for the region.

Once a particular developer is prepared to proceed and has submitted the necessary information as required under the various development guidelines, discussions can begin in earnest on securing a settlement option.

In order to reduce uncertainty as to the respective roles of the Province and the resource company, and to ensure that implementation of the settlement option proceeds efficiently, the respective roles and responsibilities of the private and public sectors have to be clear. The most effective route to this end is a "comprehensive development agreement". This is an instrument which specifies who does what, when things are to be done and who pays. A more specific list of possible topics for inclusion in a development agreement is shown in figure eleven. The development agreements for the North East Coal project, especially the Tumbler Ridge agreements, provide a model for such an approach.

6.3.2 Financing Development: Fair Sharing of Costs and Risks

The financial analysis of settlement options focussed on capital costs and not on operating costs. Furthermore it focussed on total capital costs rather than the distribution or sharing of costs between various parties. This was deliberate. The sharing of costs in developments of this size and complexity will be the result of negotiation between the affected parties: the Province, the Federal Government, local government and the resource company. While cost sharing arrangements cannot be established at this point, the basic principles which should underlie negotiations can be articulated so as to provide

Figure Eleven: Contents of a Comprehensive Development Agreement

1. Financial

- cost sharing between province and company
- guarantees of performance
- municipal taxation
- inflation
- cost sharing between companies

2. Organizational

- local government
- community boundaries
- timing of services
- organization for implementation
- enforcing the agreement

3. Social

- responsibilities for providing services
- employment objectives
- housing policies
- business development programme

4. Physical

- location of the community
- allocation of land
- responsibility for planning
- environmental management

guidance to the resource developer. As outlined in chapter 3.0, the Ministry of Municipal Affairs has a set of resource community development objectives which have guided the Ministry's responses to large scale resource development projects in the past. Four of these are financial in nature:

- to ensure that the costs resulting from full or partial failure of the resource enterprise do not accrue to the Province or the community;
- to ensure equitable treatment of all resource companies in the Province;
- to ensure equitable treatment of all resource communities in the Province; and
- to ensure that municipalities are adequately compensated if they are adversely affected by large scale resource development projects.

The most critical of these objectives is risk protection for the public sector. The process of exchange outlined above can lead to a verification of the risks associated with development of a project. The provincial role involves:

- requiring the resource company to undertake extensive manpower demand and supply analysis for its project;
- verifying company manpower projections, population projections and demographic implications; and
- providing municipal financial analysis of a variety of settlement options and development scenarios.

Through a joint effort involving company provision of information and provincial verification, the risks associated with a project can be reduced and appropriate financial measures can be incorporated in a development agreement.

In addition to the development analysis outlined above, the Ministry has a set of policies to guide the planning and management of large scale projects. Consequently, the Ministry should be able to respond efficiently and equitably to expected financial issues in Northwest British Columbia. Furthermore, the resource developers' can be more certain as to the policies which will apply.

The most critical of these policies are listed below.

Taxation of Industrial Assets by Local Government. The Ministry has recently completed a major review of municipal boundary extensions to enable municipal taxation of large scale industrial enterprises. Principles have been suggested to guide the enclosure of industrial establishments within municipalities, the setting of tax rates and the sharing of revenues between local governments where appropriate. It has been concluded that municipal taxation can provide a mechanism for equitable sharing of the costs of municipal infrastructure to house the industry's employees.

Tax Base Sharing. Where a large industrial enterprise is located such that more than one community houses the workforce, tax base sharing provides a means for an equitable sharing of the costs and benefits of industrial development between municipalities. The recent agreement for the Elk Valley (Elkford, Fernie and Sparwood) provides a model for future developments.

Risk Protection. New development projects will necessitate major capital expenditures for local government. It is vital that municipalities be adequately protected should these projects not proceed as planned or fail prematurely. The Ministry has developed policies to guide its intervention in this area. These emphasize securing guarantees of performance from industrial developers where municipalities are placed at risk. The availability of the policy should serve to reduce uncertainty for prospective developers in the region.

Financial Contribution. Large scale resource development projects may create extraordinary financial costs for local

municipalities which may require offsetting financial contributions from resource developers. The Ministries of Industry and Small Business Development and Municipal Affairs have jointly developed methods and policies for determining whether financial contributions are required. Once project proposals are received, the analysis can be undertaken. The availability of the policy should alleviate uncertainty for resource developers.

6.3.3 Organization and Management of Settlements

Selecting a settlement option concerns not only securing a development agreement regarding sharing of responsibilities and the development of appropriate policies for financing that settlement choice, it also concerns implementation of that choice. The decision on organization/ management of implementation is dependent on the settlement option selected. Development options which lead to incremental change to settlements are best handled by local government and normal programmes. Settlement options which lead to radical change to existing communities or development of new communities will require provincial intervention. Decisions would have to be made on the "method of development" and the "organization for implementation". The Ministry of Municipal Affairs has undertaken considerable research and has valuable experience in both areas [MMA, 1977 and 1979]. The options for organization and management are rich and the legislative flexibility exists to custom design an approach commensurate with the peculiarities of the particular situation in the Northwest.

7.0 CONCLUSIONS

The final chapter of this report indicates future directions if the Northwest is to be developed. Needs in the areas of local government development, inter-governmental discussion, research and regional investigations are identified. The intent is to lay out an agenda for further work over the next few years.

7.1 Local Government Development

The proposed mine developments are located in an area of the province in which there are no incorporated municipalities (figure twelve). Existing settlements in the area -- Telegraph Creek, Cassiar, Iskut/Eddontenjon -- have no local self government. While the southern part of the Northern Zone is contained within the Kitimat-Stikine Regional District, the northern part, which includes Dease Lake and Cassiar, is enclosed within the unincorporated Stikine region. Consequently, it lacks regional representation and is less able to participate in development decisions. If development is to take place consideration will have to be given to local government options for the region and various settlements within it. Specifically the following should be looked at:

- the adequacy of existing regional district boundaries;
- alternative ways of delivering local services to rural communities; and
- local government options for Cassiar.

Changes to strengthen local institutions would enable local residents to participate more effectively in regional development.

LOCAL GOVERNMENT STRUCTURE
NORTHWEST BRITISH COLUMBIA

Fig. Twelve

• Incorporated Municipalities

Scale: 1" = 68 miles

7.2 Inter-Government Relations

Two areas of inter-governmental relations requiring further examination are: 1) native Indian issues; and 2) access through Alaska.

A large proportion of the regional population is composed of Native peoples. A co-ordinated approach to the development of the region will require discussions between the Province and the Government of Canada regarding resolution of outstanding Native issues. At the same time the Ministry of Municipal Affairs is prepared to discuss the possibilities of incorporation of Indian Reserves as local governments in order to assist Native communities in providing local services to themselves.

The development of the western parts of the region, particularly the development of the Stikine Copper Project, could be more effectively accomplished by providing access through Alaska to the Stikine River Valley. Consequently, discussions with the Governments of United States and Alaska regarding acquisition of access through the Alaskan Panhandle to northwest B.C. may be required.

7.3 Research

The previous chapters have argued for a serious examination of the potentials of long range block time commuting for the region. There is a pressing need for further research in a number of areas in order to definitively determine the desirability and feasibility of commuting. Specifically, research is required on:

- the social implications of commuting for the worker, the family, the community and workplace;
- the adaptability of commuting schemes to various mining projects and localities;

- mitigative measures that would make implementation more efficient and equitable; and
- travel time and travel mode preferences of northern workers.

Further research in the above areas would allow for more informed decision making on settlement options in the northwest.

7.4 Regional Investigations

If a decision is made to proceed with further planning with respect to the development of the region, a number of regional investigations would have to be undertaken. These include the following:

- comprehensive survey of manpower availability in the Region in terms of skills, training needs and workforce attitudes;
- biophysical analysis of potential townsites to determine their suitability for urban development;
- investigations of potential air routes, airports and navigational aids; and
- examination of the social implications for existing communities of proposed developments.

These studies would be necessary to facilitiate development of the region.

7.5 Conclusions

As stated before, a decision regarding settlement options cannot and should not be made at this time. Commitments and decisions must be made regarding mine construction dates, workforce size, energy networks, transportation systems, and commuting policy. This report has identified the range of possible settlement options and has indicated the directions of further work.

The Settlement Strategy has provided a framework of objectives and policies to guide decisions on settlement options. The final chapter, in turn, outlines areas in which preparatory work should take place over the next few years. The strategy and an on-going work programme will place the province in a strong position to make well informed decisions regarding developing the Northwest.

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APPENDIX "A"

POPULATION ANALYSIS: POTENTIAL NEW COMMUNITIES NORTHWEST REGION

Prepared by:

Policy and Research Branch
Ministry of Municipal Affairs

Prepared for:

Municipal Group
Inter-Ministry Task Force on Northwest
Economic Opportunities
Province of British Columbia

POPULATION ANALYSIS

A.1 INTRODUCTION

Two sets of population projections were computed for the settlement strategy. Populations for the proposed new communities were estimated using the Ministry of Municipal Affairs' population model. Incremental population increases for the five southern regional centres participating in the proposed commuting scheme were estimated using the Northeast Coal regional employment and population multipliers. Both sets of projections use construction and operating workforce figures plus a set of demographic assumptions to project future population.

Note that the population projections were used for planning purposes, specifically to develop the proposed facilities programs for the settlement strategy and enable estimation of order-of-magnitude capital costs, therefore should not be interpreted as a definitive projection.

A.2 POPULATION PROJECTIONS FOR THE PROPOSED NEW COMMUNITIES

A.2.1 Construction Workforce

The construction workforce is illustrated in Table A-1. It is based on the following assumptions:

- three year construction period before first year of full operation of open pit mines; two year construction period for underground mines; and
- construction workforce for open pit mines assumed to be .8, 1.2, and 1.0 of estimated mine operating workforce; for underground mines, assumed to be .8 and 1.2 of estimated mine operating workforce.

Table A-1: Northwest Development Opportunities - Construction Workforce

Year	Turnagain	Kinaskan	Mess Lake	Kluyetz/Tsetia	Total[1]
1984	360	-	-	-	360
1985	540	-	-	-	540
1986	450	-	-	-	450
1987	280	300	-	1000	1580
1988	420	450	-	1500	2370
1989	350	1335	960	1250	2935
1990	-	1440	1440	-	1440
1991	-	1200	1200	-	1200
1992	200	-	-	-	200
1993	300	-	-	-	300
1994	250	-	-	-	250
1995	-	-	-	-	-
1996	-	-	-	-	-
1997	-	-	-	-	-
1998	-	-	-	-	-
1999	-	-	-	-	-
2000	-	-	-	-	-

Source: Ministry of Industry & Small Business Development.

[1] Does not include Mine construction Workforce figures for Mess Lake as this community is an alternative to Kinaskan. Both proposed communities include the Schaft Creek Mine Construction Workforce.

A.2.2 Mine Operating Workforce

The mine operating workforce is shown in Table A-2. The total operating workforce was estimated by using mine employment figures from existing mines with similar production outputs as proposed for the mines in the northwest. The pre-operating mine workforce was assumed to be .2 of total mine workforce for the year preceeding the start-up of the mine.

A.2.3 Demographic Assumptions

The following assumptions were used by the population model to generate the populations for the proposed new communities. These assumptions were derived from current research on resource communities and from previous experiences in the province:

- 90% of the mine construction workforce is in camp initially. This decreases to 80% later on;
- all mine operating employees are assumed to live in town;
- 95% of the mine workforce and 50% of the induced workforce is male. The percentages of the direct workforce which is male decreases to 80% in later years. The induced workforce remains constant;
- the induced workforce is split evenly between males and females (50%/50%);
- the induced employment multiplier increases from .2 induced workers per direct employee in the initial years to .4 in the later years;
- the proportion of the construction workforce which influences indirect employment is assumed to be 5%;
- the percentage of mine workers in families increases from 20% to 30% and to 35%. Those in couples increases from 20% to 30%;
- the percentage of the induced workforce which is single decreases from 50% to 40%; families increase from 30% to 45% and couples decrease from 20% to 15%;

Table A-2: Northwest Development Opportunities Mine Operating Workforce

Year	Turnagain	Kinaskan	Mess Lake	Kluyetz/Tsetia	Total[1]
1986	90	-	-	-	90
1987	450	-	-	-	450
1988	450	-	-	-	450
1989	520	75	-	250	845
1990	800	375	-	1250	2425
1991	800	615	240	1250	2665
1992	800	1575	1200	1250	3625
1993	800	1575	1200	1250	3625
1994	850	1575	1200	1250	3675
1995	1050	1575	1200	1250	3875
1996	1050	1575	1200	1250	3875
1997	1050	1575	1200	1250	3875
1998	600	1575	1200	1250	3425
1999	600	1575	1200	1250	3425
2000	600	1575	1200	1250	3425

Source: Ministry of Industry & Small Business Development

[1] Does not include Mine Workforce figures for Mess Lake as this community is an alternative to Kinaskan. Both proposed communities include the Schaft Creek Mine workforce.

- the average family size of married workers for both direct and indirect workers increases from 3.0 to 3.5;
- 30% of the children are 0 to 4 years; 35% are from 5 to 12; 17% from 13-16; 18% from 17 to 18;
- the proportion of the 17-18 age group not in school is assumed to be 60%; and
- the unemployment rate is assumed to be 0.

A.2.4 Population Projections for the New Communities

Using the Ministry of Municipal Affairs' population model, projections for the proposed new communities were estimated for the time period 1984 to 2001. These projections are summarized in Table A-3.

A.3 POPULATION PROJECTIONS FOR THE SOUTHERN REGIONAL CENTRES

Incremental regional population projections were calculated for three scenarios. The high scenario assumes all projects will use commuting schemes from the southern regional centres and work camps for on-site housing. The medium scenario assumes five of the projects -- Sustut, Stikine, Letain, Eaglehead, and Kutcho Creek -- will use commuting schemes. The low scenario assumes only Sustut and Stikine will use commuting schemes.

A.3.1 Construction Workforce

The construction workforce for the region is illustrated in Table A-4. It is based on the same assumptions used for the population projections for the proposed new communities.

Table A-3: Northwest Economic Development Opportunities - Population Projections

Year	Turnagain	Kinaskan	Mess Lake	Kluyetz/Tsetia	Total[1]
1986	647	-	-	-	647
1987	1072	-	-	-	1072
1988	1407	-	-	-	1407
1989	1664	288	-	809	2761
1990	1876	873	-	2142	4891
1991	1876	1878	775	2937	6691
1992	2199	3663	2052	2937	8799
1993	2349	3663	2814	2937	8949
1994	2413	3663	2814	2937	9013
1995	2586	3663	2814	2937	9186
1996	2586	3663	2814	2937	9186
1997	2586	3663	2814	2937	9186
1998	1475	3663	2814	2937	8075
1999	1475	3663	2814	2937	8075
2000	1475	3663	2814	2937	8075

Source: Ministry of Industry & Small Business Development

[1] Note the regional total does not include Mess Lake as it is an alternative to Kinaskan Town, consequently its population is included as part of Kinaskan.

Table A-4
Regional Total of Construction Workforce

Scenarios[1]	1986	1991	1996	2001
high	450	1200	-	-
medium	450	-	-	-
low	-	-	-	-

Notes:

1 high scenario: all mine projects employ block time commuting.
medium scenario: Stikine, Sustut, Letain, Eaglehead and Kutcho employ block time commuting.
low scenario: Stikine and Sustual employ block time commuting.

A.3.2 Mine Operating Workforce

The mine operating workforce for the region is shown in Table A-5. It is based on the same assumptions used for the population projections for the proposed new communities.

Table A-5
Regional Total for Mine Operating Workforce

Scenarios[1]	1986	1991	1996	2001
high	90	2665	4225	4225
medium	90	800	1400	1400
low	-	-	350	800

Notes:

1 high scenario: all mine projects employ block time commuting.
medium scenario: Stikine, Sustut, Letain, Eaglehead and Kutcho employ block time commuting.
low scenario: Stikine and Sustual employ block time commuting.

A.3.3 Northeast Coal Employment and Population Multipliers

The following multipliers were used to generate the incremental regional population impacts of the proposed mining projects for the three scenarios:

- Secondary construction employment multiplier: 0.35;
- Secondary basic employment multiplier: 1.5;
- Direct construction population multiplier: 0.50;
- Direct basic population multiplier: 2.50;
- Secondary construction population multiplier: 2.50; and
- Secondary basic population multiplier: 2.50.

A.3.4 Population Projections for the Regional Centres

Using the incremental regional population projections estimated by the Northeast Coal employment and population multipliers, incremental population projections for the regional centres were estimated. It was assumed that the incremental regional population increase would be distributed between the five regional centres -- Prince Rupert, Terrace, Kitimat, Smithers, and Stewart -- in the same proportion as their current 1981 population is distributed. These incremental projections are summarized in Table A-6.

Table A-6: Potential Range of Population Impacts of Proposed Mine Projects on Regional Centres in Northwest British Columbia

	Existing Population[1] 1981		Projected Population Increase[2] 1986	1991	1996	2001
Prince Rupert	16,197	h	414	6407	9242	9242
		m	414	1750	3062	3062
		l	-	-	766	1750
Terrace	10,914	h	283	4393	6337	6337
		m	283	1200	2100	2100
		l	-	-	525	1200
Kitimat	12,814	h	331	5126	7394	7394
		m	331	1400	2450	2450
		l	-	-	612	1400
Smithers	4,570	h	118	1831	2641	2641
		m	118	500	875	875
		l	-	-	219	500
Stewart	1,456	h	35	549	792	792
		m	35	150	263	263
		l	-	-	66	150
Total	45,951	h	1181	18306	26406	26406
		m	1181	5000	8750	8750
		l	-	-	2188	5000

[1] 1981 population figures are Statistics Canada 1981.

[2] h = High Scenario: All mine projects employ block time commuting.
m = Mid Scenario: Stikine, Sustut, Letain, Eaglehead and Kutcho employ block time commuting.
l = Low Scenario: Stikine and Sustut employ block time commuting.

APPENDIX "B"

FACILITIES AND HOUSING ANALYSIS
POTENTIAL NEW COMMUNITIES NORTHWEST REGION

Prepared by:

Policy and Research Branch
Ministry of Municipal Affairs

Prepared for:

Municipal Group
Inter-Municipal Task Force on Northwest
Economic Opportunities
Province of British Columbia

FACILITIES PROGRAM

B.1 INTRODUCTION

A set of community facilities is derived for each town. Most of the service standards stem from research performed in the examinations of Tumbler Ridge, but in all cases it should be pointed out that the final array of facilities would depend to a larger degree on the decisions of the eventual residents. This is particularly true for those amenities funded mainly by the municipality. It is also true, although to a lesser degree, for numerous other facilities. As each town grows and develops its individual identity, the residents' wishes for their community will play an increasingly stronger role in determining the schedule of facilities.

The approach taken here is that each town would select what could be called a standard array of services commonly found in similar communities. To this extent it is reasonable to suggest the use of prevailing standards for the delivery of various social services where such standards can be identified.

- Provincial services, such as human resources or health care, can be generally dealt with in terms of standards from the appropriate ministries, although some interpretive discretion is obviously required
- Municipal facilities, for example a recreation cmplex or a municipal hall are based on observations of existing resource communities.
- Education facilities are based on standards from the Ministry of Education and from discussions with community college staff
- Commercial and light industrial facilities are based on various private and public studies dealing with market activity in resource towns.

The principle assumptions deal as much with timing as with floorspaces. In order to meet various social goals regarding the quality of life and to ensure an attractive community from the start of the resource firm's hiring campaign, it is

assumed that many facilities and services would be completed prior to the first residents arriving. However, this often involves too much construction for just one year and so some is started in the previous year. In some cases this means an initial overcapacity will be created since many facilities do not lend themselves to incremental construction each year. It is more realistic and economic to assume temporary over-capacities than small building additions. A notable exception to this is schools where, given appropriate designs, additions can be economical.

One particularly important aspect of timing is the basic assumption that the final year population is known from the start. It is recognized that, while absolute knowledge is not possible, accurate and experienced forecasts as to basic industry workforce requirements by the resource company or companies would allow for reliable population predictions. The salient feature here is that each town is planned and developed in the belief that the final population will be reached.

B.1.1 Schools

The schedule of schools is based on the Ministry of Education's publication "B.C. School Facilities Manual, Part 4, Space Standards", October 1980. The projected school facility and enrollment is illustrated in table B-1.

B.1.2 Community College

It is assumed that the town would be far enough from the nearest larger town to warrant a separate community college branch. A facility of 500 ca is assumed for each town. This would likely be provided by leased space in other buildings such as local schools, a community centre, or a commercial structure.

Table B-1: Northwest Economic Development Opportunities - School Enrollment and Facilities

	size (ca)	capacity (students)	starting date	Enrollment: 1986	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996
1. Turnagain Town														
Elementary	1995	250	1989	11	37	56	101	151	151	174	183	191	224	224
Secondary	2860	200	1992	7	26	39	70	104	104	121	127	125	125	155
2. Kinaskan Town														
Elementary	2190	300	1992	-	-	-	17	49	169	298	298	298	298	298
Secondary	2860	200	1992	-	-	-	11	34	117	206	206	206	206	206
3. Mess Lake/Bob Quinn Town														
Elementary	1955	250	1991	-	-	-	47	92	227	227	227	227	227	227
Secondary	2860	200	1991	-	-	-	33	64	157	157	157	157	157	157
4. Kluayetz/Tsetia Town														
Elementary	1430	150	1991	-	-	-	29	58	142	142	142	142	142	142
Seconday	2860	200	1991	-	-	-	20	40	98	98	98	98	98	98

B.1.3 Health

It is assumed that each community would have a basic diagnostic and treatment centre which would provide space for a doctor, dentist, public health nurse, a holding area and specialized facilities such as a laboratory and a X-Ray. Kinaskan town could add an additional 150 ca in 1991. A basic ambulance facility -- office area and garage(s) -- of 150 ca is assumed for all four towns.

It also is assumed that various public services are administrated from a single government centre. This allows each to be discussed in terms of small floorspaces which would be uneconomic to create individually but which would in fact be economic if part of a larger integrated facility. For purposes here, public and mental health functions are included in such a centre. It is assumed that some services would be offered on a part-time basis by staff whose base office is located in a nearby community. In this case there is one "social agency" space of 100 ca. It is undifferentiated as to the individual spaces for various services such as public and mental health, human resources, or employment agency because it is not clear which services would be offered in this manner.

B.1.4 Social

As mentioned above, an undifferentiated space of 100 ca is assumed for social/health services initially for each town. A day care centre of 150 ca is incorporated as part of some other public structure for example the recreation centre or the school. The first day care centre is assumed to be a public sector enterprise so that this service is assured in the early years. Subsequent day care facilities are assumed to be private sector enterprises and would be offered in dwellings or other private spaces.

B.1.5 Courts

The size of the communities is such that a single purpose courtroom could not be justified. Court services would function either on a part time basis using borrowed space or be provided in another community.

B.1.6 Recreation/Culture

Each town would start out with a recreation centre. This would include an arena, curling rink and meeting space.

Community parks are created at the rate of 12.8 ca per capita and neighbourhood parks (including totlots) at 14.4 ca per person. Tennis courts are based on one court plus one per 2500 people hence two courts for each proposed town is recommended.

The library floorspaces generally conform to standards as suggested by the provincial Library Services Branch. A library of 185 ca would be provided.

B.1.7 Municipal

In each town a municipal hall of 200 ca and public works buildings (280 ca) are provided from the start.

The town is assumed to require a fire hall of 150 ca starting in the first year.

B.1.8 Police

It is assumed that RCMP service is based in another community, and one office of a multi-service complex is set aside for this function.

B.1.9 Commercial/Light Industrial

The following assumptions have been made with respect to commercial and light industrial development.*

- Retail/Office per cap. = 0.9 ca
- Hotel/Motel per cap. = .8 ca
- Service Comm. per cap. = .25 ca
- Light Industry per cap. = 2.50 ca

B.1.10 Communications

A telephone facility of 300 ca is assumed for each town. While it is extremely difficult to estimate the radio and/or television space requirements for the town, it is felt that no facility of facilities would be warranted due to the small size of the four proposed towns.

B.1.11 Summary

Tables B-2, B-3, B-4 and B-5 summarize the facilities plan for the four proposed new towns: Kinaskan, Mess Lake/Bob Quinn Lake/Telegraph Creek, Kluayetz/Tsetia, and Turnagain.

B.2 HOUSING

The population model provides a distribution of social unit types: families, couples and singles. In order to arrive at the number and distribution of housing types the following assumptions were made as housing preferences:

	detached	attached	apt.	mobile
families	75%	5%	5%	15%
couples	45%	10%	25%	20%
singles	5%	5%	75%	15%

1 Sussex Consultants Ltd. Resource Community Planning, Municipal Finance, Implications of Community Size.

Table B-2: Kinaskan Town: Facilities Programme

YEAR	1989	1990	1991	1992	1993	1994	1995	1996	1997	TOTAL
POPULATION	288	873	1878	3663	3663	3663	3663	3663	3663	
FACILITIES (in ca):										
Elementary/ Secondary School	0	3710	0	0	0	0	0	0	0	3710
Community College	0	0	500	0	0	0	0	0	0	500
Diagnostic Centre	0	0	250	150	0	0	0	0	0	400
Ambulance	0	0	150	0	0	0	0	0	0	150
Day Care Facilities	0	150	0	0	0	0	0	0	0	150
Social Agencies	0	100	0	50	0	0	0	0	0	150
Recreation Centre	0	0	3,625	0	0	0	0	0	0	3,625
Commun. Pk.	0	11,000	13,000	11,000	11,000	0	0	0	0	46,000
Neighb. Pk.	0	12,500	14,500	13,000	13,000	0	0	0	0	53,000
Tennis (No. Courts)	0	2	0	0	0	0	0	0	0	2
Library	0	0	185	0	0	0	0	0	0	185
Municipal Hall	0	200	0	0	0	0	0	0	0	200
Public Works	0	280	0	0	0	0	0	0	0	280
Fire Protection	0	150	0	0	0	0	0	0	0	150
Police/RCMP	0	20	0	0	0	0	0	0	0	20
Retail, Office, Etc.	0	800	900	800	800	0	0	0	0	3,300
Hotel/Motel	0	700	800	700	700	0	0	0	0	2,900
Service Commercial	0	218	250	250	250	0	0	0	0	968
Light Industrial	0	2,100	1,009	890	890	0	0	0	0	4,900
Post Office	0	120	0	0	0	0	0	0	0	120
Telephone	0	500	0	0	0	0	0	0	0	500

Table B-3: Mess Lake/Bob Quinn Lake/Telegraph Creek Town: Facilities Programme

YEAR	1989	1990	1991	1992	1993	1994	1995	1996	1997	TOTAL
POPULATION	775	2052	2814	2814	2814	2814	2814	2814	2814	
FACILITIES (in ca):										
Elementary / Secondary School	2995	0	0	0	0	0	0	0	0	2995
Community College	0	0	500	0	0	0	0	0	0	500
Diagnostic Centre	0	250	0	0	0	0	0	0	0	250
Ambulance	0	150	0	0	0	0	0	0	0	150
Day Care Facilities	0	250	0	0	0	0	0	0	0	250
Social Agencies	0	150	0	0	0	0	0	0	0	100
Recreation Centre	0	0	3,625	0	0	0	0	0	0	3,625
Comaun. Pk.	9,000	9,000	9,000	9,000	0	0	0	0	0	36,000
Neighb. Pk.	10,000	10,000	10,000	10,000	0	0	0	0	0	40,000
Tennis (No. Courts)	2	0	0	0	0	0	0	0	0	2
Library	0	0	185	0	0	0	0	0	0	185
Municipal Hall	200	0	0	0	0	0	0	0	0	200
Public Works	280	0	0	0	0	0	0	0	0	280
Fire Protection	150	0	0	0	0	0	0	0	0	150
Police/RCMP	20	0	0	0	0	0	0	0	0	20
Retail, Office, Etc.	700	1,146	690	0	0	0	0	0	0	2,536
Hotel/Motel	560	1,080	610	0	0	0	0	0	0	2,250
Service Commercial	194	320	190	0	0	0	0	0	0	704
Light Industrial	1,900	3,200	1,900	0	0	0	0	0	0	7,000
Post Office	0	120	0	0	0	0	0	0	0	120
Telephone	0	300	0	0	0	0	0	0	0	300

Table B-4: Kluayetz/Tsetia Town: Facilities Programme

YEAR	1989	1990	1991	1992	1993	1994	1995	TOTAL
population	809	2142	2937	2937	2937	2937	2937	
facilities (in ca):								
Elementary School/ Secondary School	2520	0	0	0	0	0	0	2,520
Community College	0	0	500	0	0	0	0	500
Diagnostic Centre	0	250	0	0	0	0	0	250
Ambulance	0	150	0	0	0	0	0	150
Day Care Facilities	0	150	0	0	0	0	0	150
Social Agencies	0	100	0	0	0	0	0	100
Recreation Centre	0	3,625	0	0	0	0	0	3,625
Commun. Pk.	10,350	17,000	10,000	0	0	0	0	37,350
Neighb. Pk.	11,600	19,000	11,500	0	0	0	0	42,100
Tennis (No. Courts)	0	2	0	0	0	0	0	2
Library	0	185	0	0	0	0	0	185
Municipal Hall	200	0	0	0	0	0	0	200
Public Works	280	0	0	0	0	0	0	280
Fire Protection	150	0	0	0	0	0	0	150
Police/RCMP	20	0	0	0	0	0	0	20
Retail, Office, Etc.	728	1,200	715	0	0	0	0	2,643
Hotel/Motel	647	1,300	640	0	0	0	0	2,587
Service Commercial	200	333	200	0	0	0	0	730
Light Industrial	3,700	3,700	0	0	0	0	0	7,400
Post Office	120	0	0	0	0	0	0	120
Telephone	500	0	0	0	0	0	0	500

Table B-5: Turnagain Town: Facilities Programme

YEAR	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995	TOTAL
POPULATION	647	1072	1407	1664	1876	1876	2199	2349	2413	2586	
facilities (in ca.):											
Elementary/ Secondary School	2166	0	0	0	0	829	0	0	0	0	2,995
Community College	0	500	0	0	0	0	0	0	0	0	500
Diagnostic Centre	0	0	0	0	250	0	0	0	0	0	250
Ambulance	0	0	0	0	150	0	0	0	0	0	150
Day Care Facilities	0	0	0	0	150	0	0	0	0	0	150
Social Agencies	0	0	0	0	100	0	0	0	0	0	100
Recreation Centre	0	3625	0	0	0	0	0	0	0	0	3,625
Commun. Pk.	8000	5400	4300	3300	3000	3000	3000	3000	3000	0	33,000
Neighb. Pk.	9300	6300	5000	3800	3800	3800	3800	3800	3800	0	35,800
Tennis (No. Courts)	2	0	0	0	0	0	0	0	0	0	2
Library	0	185	0	0	0	0	0	0	0	0	185
Municipal Hall	200	0	0	0	0	0	0	0	0	0	200
Public Works	280	0	0	0	0	0	0	0	0	0	280
Fire Protection	150	0	0	0	0	0	0	0	0	0	150
Police/RCMP	20	0	0	0	0	0	0	0	0	0	20
Retail,Office, Etc.	580	380	0	530	480	0	0	640	0	0	2,610
Hotel/Motel	520	340	270	270	0	0	0	600	0	0	2,000
Service Commercial	160	100	100	0	0	133	0	100	0	0	533
Light Industrial	1600	1100	800	0	0	800	0	500	0	0	4,800
Post Office	120	0	0	0	0	0	0	0	0	0	120
Telephone	300	0	0	0	0	0	0	0	0	0	300

It is also assumed that 30% of "singles" double to become "couples". Applying these assumptions to the four towns yields the distribution of dwelling units for the final or peak year (illustrated in Table B-6).

Table B-6: Distribution of Dwelling Units

1. Turnagain Town

	social unit total	detached	attached	apt.	mobile
families	426	320	21	21	63
couples	220	199	22	55	45
singles	185	9	9	215	28
TOTAL	831	420	52	215	136
Percentage		51%	6%	26%	16%

2. Kinaskan Town

	social unit total	detached	attached	apt.	mobile
families	651	488	33	33	98
couples	680	306	68	170	136
singles	557	28	28	418	48
TOTAL	1888	822	129	621	318
Percentage		43%	7%	17%	33%

3. Mess Lake/Bob Quinn Lake Town

	social unit total	detached	attached	apt.	mobile
families	432	324	22	22	66
couples	360	162	36	40	72
singles	307	15	15	230	45
TOTAL	1099	501	73	292	183
Percentage		48%	7%	28%	17%

4. Kluayetz/Tsetia Town

	social unit total	detached	attached	apt.	mobile
families	363	272	18	18	54
couples	386	174	39	97	77
singles	323	16	16	242	48
TOTAL	1072	462	73	357	179
Percentage		43%	7%	33%	17%

APPENDIX "C"

FINANCIAL ANALYSIS OF POTENTIAL NEW COMMUNITIES NORTHWEST REGION

Prepared by:
Policy and Research Branch
Ministry of Municipal Affairs

Prepared for:

Municipal Group
Inter-Ministry Task Force on Northwest
Economic Opportunities
Province of British Columbia

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FINANCIAL ANALYSIS

C.1 INTRODUCTION

A financial analysis to determine the capital costs of the facilities and housing programme as established in Appendix B was undertaken for each of the potential new towns: Kinaskan, Bob Quinn Lake/Mess Lake/Telegraph Creek, Kluayetz/Tsetia, and Turnagain. This appendix provides preliminary estimates of construction, equipment, and servicing costs for each option. They indicate only the magnitude and not the actual expenditure to be expected as the assumptions regarding work force size, starting dates, and townsite locations have yet to be confirmed.

C.2 CAPITAL COST OF FACILITIES

This section outlines the capital costs of the planned facilities program. These costs are calculated by adding the estimated construction costs and the estimated equipment costs. Construction costs are calculated by multiplying the estimated building floor space in centares* of a facility by the basic 1982 building cost per centare, then by the isolation factor. The equipment cost is calculated by multiplying the estimated floor space of a facility by the 1982 eqiupment cost per centare. In addition to these two costs, for some facilities, the miscellaneous costs not included in the equipment costs are added to the total. Items falling into this category include site work for schools; vehicles and heavy equipment for ambulance, public works, fire protection, and police services; and books for the library. There are some facilities which have building costs but no equipment costs, specifically outdoor recreation, commercial and light industrial. In summary,

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* one centare is equivalent to a square metre.

the capital costs of a facility is equal to the total of the estimated construction costs, the estimated equipment costs, if applicable, and the miscellaneous costs, if applicable.

The schedule of construction is smoothed so that larger facilities are built over two years: one-half in the year prior to need and one-half in the year of need. Some facilities which initially appear to be small also are built over two years because they actually are part of a larger multi-facility complex. Facilities which are built solely in the year of need are the following:

- community and neighbourhood parks;
- tennis courts;
- library;
- commercial/light industrial buildings;
- housing; and
- most expansions to buildings.

C.2.1 Isolation Factor

An isolation factor is included in the calculation of building costs since normal costs would not apply due to the higher cost of labour. These costs stem from:

- the need for a construction camp to provide room and board for the workers;
- a guaranteed minimum work week in excess of the norm, with overtime hours at double-time pay;
- the loss in workers' productivity due to the longer hours; and
- the possibility that regional demand for construction workers would drive up wage rates.

Since the planned towns would be resource based communities and therefore, for most workers, likely to be outside of the daily commuting range of established towns, a construction camp would be necessary. The longer work week would be necessary to attract workers and to ensure the required amount of construction is completed, particularly in the

initial years. It is assumed that regional demand for construction workers would be high since there would be considerable simultaneous construction activity in the region for rail, roads, energy and mine development.

Due to these factors, labour costs and consequently construction costs would be considerably higher than normal. The higher construction costs are accounted for in the isolation factor, which would decrease as the population of the community increases, as a larger number of construction workers live in town and as building requirements decrease. A starting factor of 1.3 is assumed for all towns. This means that construction costs in the early years would be 30% above the norm. A building usually costing $100,000 would cost $130,000 due to this factor.

C.2.2 Basic Costs

The isolation factor is applied to the basic construction costs but not to equipment costs since equipment would not be built at the construction site. Basic building costs include site clearing and preparation, inspections and permits, standard architectural and engineering fees, utility connections, and actual building construction. It must be noted, however, that while these building costs are reasonable estimates, they are not precise since they cannot reflect particular building designs, site or soil conditions, materials selections, or other specific characteristics of a building. Table C-1 shows the basic costs before the isolation factor is applied.

Equipment costs include such standard items as desks, tables, machines, filing cabinets and other non-built-in components. These also are shown in Table C-1.

Table C-1: Base Unit Costs

	1981 Dollars Per Ca[1]		1982 Dollars Per Ca[2]	
	Equipment & Furniture	Construction	Equipment & Furniture	Construction
Elementary School	$140	$825	$155	916
Secondary School	160	860	178	955
Community College	105	735	117	816
Diagnostic/Treatment Centre	250[3]	925	278	1027
Ambulance	35	400	39	444
Public & Mental Health	75	730	83	810
Dental	250	925	278	1027
Day Care: Institutional	65	525	72	583
Private	na	250	na	278
Human Resources/Employment/Probation	75	835	83	927
Recreation Centre	15	695	17	771
Parks:				
Community ($/ca land)	na	5.00	na	5.55
Neighborhood($/ca land)	na	5.30	na	5.90
Tennis Court ($ per court)	na	23,000	na	25,530
Library	95[4]	1150	105	1277
Municipal Hall	90	865	100	960
Public Works	30	515	33	572
Fire Protection	50	1120	56	1243
Police/R.C.M.P.	50	2000	56	2220
Retail/Office	na	500	na	555
Hotel/Motel	na	470	na	522
Service Commercial/ Light Industrial	na	315	na	350
Post Office	75	1040	83	1154
Residential: Detached		$66,000		$73,000
Attached		57,000		63,000
Townhouse		50,000		56,000
Apartment/Hostel		23,000		26,000
Mobile Home		27,000		30,000

1 Source: Sussex Consultants Ltd., Resource Community Planning, Municipal Finance Implications of Community Size.

2 Size costs are escalated 11% as per the Statistics Canada Consumer Price Index for June 1981 and June of 1982.

3 excludes vehicles

4 excludes books

The method for calculating the capital costs of telephone and television/radio facilities deviates slightly from the standard method by which the other facilities' capital costs are calculated. Capital costs of telephone facilities are calculated via an assumed construction phase involving $132,000, a building cost equal to $1000 per square metre, and an equipment cost represented by a per capita rate of $310. Capital costs of television/radio facilities are calculated on the basis of aggregated (in contrast to per-unit) costs of the building and equipment.

C.2.3 Summary of Facilities Cost

The following tables -- C-2, C-3, C-4 and C-5 -- summarize the estimated facilities cost for the facilities as established in Appendix B for each of the proposed new towns: Kinaskan, Mess Lake/Bob Quinn Lake/Telegraph Creek, Kluayetz/Tsetia, and Turnagain.

C.3 HOUSING AND PHYSICAL COSTS

This section calculates the housing, physical servicing costs and planning and development costs for the four potential new communities.

C.3.1 Housing Costs

Housing costs are calculated in much the same way as building costs for the other facilities. The number of dwelling units of each type for each year is multiplied by the cost per unit and then multiplied again by the appropriate isolation factor. The cost per unit of each dwelling type is the basic construction cost plus 10% to represent extra costs due to the assumed exclusive use of union labour. The extra 10% applies to all dwelling types except mobile homes since it is assumed that mobile homes would not be built at the construction site. The per-unit

Table C-2: Kinaskan Town: Facilities Costs ($000)

YEAR	1989	1990	1991	1992	1993	1994	1995	1996	1997	TOTAL
POPULATION	288	873	1878	3663	3663	3663	3663	3663	3663	
FACILITIES										
Elementary School/ Secondary School	0	5078	0	0	0	0	0	0	0	5078
Community College	0	0	701	0	0	0	0	0	0	701
Diagnostic Centre	0	0	404	242	0	0	0	0	0	696
Ambulance	0	0	92	0	0	0	0	0	0	92
Day Care Facilities	0	125	0	0	0	0	0	0	0	125
Social Agencies	0	129	0	0	0	0	0	0	0	129
Recreation Centre	0	0	3695	0	0	0	0	0	0	3695
Commun. Pk.	0	79	94	79	79	0	0	0	0	331
Neighb. Pk.	0	96	111	100	100	0	0	0	0	407
Tennis (No. Courts)	0	51	0	0	0	0	0	0	0	51
Library	0	0	326	0	0	0	0	0	0	326
Municipal Hall	0	270	0	0	0	0	0	0	0	270
Public Works	0	217	0	0	0	0	0	0	0	217
Fire Protection	0	250	0	0	0	0	0	0	0	250
Police/RCMP	0	58	0	0	0	0	0	0	0	58
Retail, Office, Etc.	0	577	649	577	577	0	0	0	0	2380
Hotel/Motel	0	475	543	475	475	0	0	0	0	1968
Service Commercial	0	99	114	114	114	0	0	0	0	441
Light Industrial	0	956	459	405	405	0	0	0	0	2225
Post Office	0	190	0	0	0	0	0	0	0	190
Telephone	0	2401	0	0	0	0	0	0	0	2401
TOTAL										21,791

Table C-3: Ness Lake/Bob Quinn Lake/Telegraph Creek: Facilities Costs ($000)

YEAR	1989	1990	1991	1992	1993	1994	1995	1996	1997	TOTAL COST
POPULATION	775	2052	2814	2814	2814	2814	2814	2814	2814	
FACILITIES										
Elementary School/ Secondary School	4099	0	0	0	0	0	0	0	0	4099
Community College	0	0	606	0	0	0	0	0	0	606
Diagnostic Centre	0	404	0	0	0	0	0	0	0	404
Ambulance	0	92	0	0	0	0	0	0	0	92
Day Care Facilities	0	125	0	0	0	0	0	0	0	125
Social Agencies	0	129	0	0	0	0	0	0	0	129
Recreation Centre	0	0	3695	0	0	0	0	0	0	3695
Commun. Pk.	65	65	65	65	0	0	0	0	0	260
Neighb. Pk.	77	77	77	77	0	0	0	0	0	308
Tennis (No. Courts)	51	0	0	0	0	0	0	0	0	51
Library	0	0	326	0	0	0	0	0	0	326
Municipal Hall	270	0	0	0	0	0	0	0	0	270
Public Works	217	0	0	0	0	0	0	0	0	217
Fire Protection	250	0	0	0	0	0	0	0	0	250
Police/RCMP	58	0	0	0	0	0	0	0	0	58
Retail, Office, Etc.	505	827	498	0	0	0	0	0	0	1830
Hotel/Motel	380	733	414	0	0	0	0	0	0	1527
Service Commercial	68	146	86	0	0	0	0	0	0	300
Light Industrial	865	1456	865	0	0	0	0	0	0	3186
Post Office	0	190	0	0	0	0	0	0	0	190
Telephone	0	1304	0	0	0	0	0	0	0	1304
TOTAL										19,226

Table C-4: Kluayetz/Tsetia Town: Facilities Costs ($000)

YEAR	1989	1990	1991	1992	1993	1994	1995	TOTAL COST
POPULATION	809	2142	2937	2937	2937	2937	2937	
FACILITIES								
Elementary School/ Secondary School	3449	0	0	0	0	0	0	3449
Community College	0	0	589	0	0	0	0	589
Diagnostic Centre	0	403	0	0	0	0	0	403
Ambulance	0	92	0	0	0	0	0	92
Day Care Facilities	0	124	0	0	0	0	0	124
Social Agencies	0	129	0	0	0	0	0	129
Recreation Centre	0	3695	0	0	0	0	0	3695
Commun. Pk.	75	123	72	0	0	0	0	270
Neighb. Pk.	89	146	88	0	0	0	0	323
Tennis (No. Courts)	0	66	0	0	0	0	0	66
Library	0	327	0	0	0	0	0	327
Municipal Hall	270	0	0	0	0	0	0	270
Public Works	217	0	0	0	0	0	0	217
Fire Protection	257	0	0	0	0	0	0	251
Police/RCMP	59	0	0	0	0	0	0	59
Retail, Office, Etc.	525	866	516	0	0	0	0	1907
Hotel/Motel	439	882	434	0	0	0	0	1755
Service Commercial	91	152	91	0	0	0	0	334
Light Industrial	1684	1684	0	0	0	0	0	3368
Post Office	190	0	0	0	0	0	0	190
Telephone	500	0	0	0	0	0	0	500
TOTAL								19,360

Table C-5: Turnagain Town: Facilities Costs ($000)

YEAR	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995	TOTAL COSTS
POPULATION	647	1072	1407	1664	1876	1876	2199	2349	2413	2586	
FACILITIES											
Elementary School/ Secondary School	0	0	0	3450	0	0	0	0	0	0	3450
Community College	0	0	0	0	0	0	0	0	0	0	606
Diagnostic Centre	0	0	0	0	404	0	0	0	0	0	404
Ambulance	0	0	0	0	92	0	0	0	0	0	92
Day Care Facilities	0	0	0	0	125	0	0	0	0	0	125
Social Agencies	0	0	0	0	129	0	0	0	0	0	129
Recreation Centre	0	0	0	0	3695	0	0	0	0	0	3695
Commun. Pk.	0	0	0	75	94	72	0	0	0	0	241
Neighb. Pk.	0	0	0	89	146	88	0	0	0	0	323
Tennis (No. Courts)	0	0	0	0	51	0	0	0	0	0	51
Library	0	0	0	0	326	0	0	0	0	0	326
Municipal Hall	0	0	0	0	270	0	0	0	0	0	270
Public Works	0	0	0	0	217	0	0	0	0	0	217
Fire Protection	0	0	0	0	250	0	0	0	0	0	250
Police/RCMP	0	0	0	0	58	0	0	0	0	0	58
Retail, Office, Etc.	0	0	0	525	867	516	0	0	0	0	1908
Hotel/Motel	0	0	0	439	882	434	0	0	0	0	1755
Service Commercial	0	0	0	914	151	91	0	0	0	0	333
Light Industrial	0	0	0	1684	1684	0	0	0	0	0	3368
Post Office	0	0	0	190	0	0	0	0	0	0	190
Telephone	0	0	0	1050	0	0	0	0	0	0	1050
TOTAL											18,841

costs excluding the isolation factor are:

detached	$66,000
duplex/attached	$57,000
townhouse	$50,000
apartment/hostel	$23,000
mobile home	$27,000

The costs are generally based on earlier work for the Tumbler Ridge project*. Table C-6 summarizes these costs for the four proposed new towns.

C.3.2 Physical Servicing Costs

Capital costs of physical servicing are based on the costs used in the Tumbler Ridge update study*. Those were derived by consulting engineers using linear measurements and specific capacities.

Physical servicing costs are determined on the basis of separately calculated:

- off-site costs;
- on-site costs; and
- CCI costs.

On-site costs refer to all costs associated with servicing residential neighbourhoods. Off-site costs basically refer to all other physical servicing costs, such as sewage treatment, water supply and treatment, and major roads and storm drainage. CCI costs are those costs associated with servicing the construction camp, commercial, and industrial areas.

C.3.2.1 Off-Site Costs

Off-site water and sewer costs are calculated on the basis of a fixed and a per capita cost. The fixed costs, which include sewerage treatment and water system and the per capita costs, which include trunks and mains, are based on the Tumbler Ridge figures.

* Sussex Consultants Ltd., Municipal Finance Implications of Community Size.

Table C-6: Housing Costs ($000)

Turnagain

	Number	Base Cost	Isolation	Total
detached	428	$73,000	$94,900	40,617
attached	52	63,000	81,900	4,259
mobile	136	30,000	39,000	5,304
apartment	215	26,000	33,800	7,267
Total				57,447

Kinaskan

	Number	Base Cost	Isolation	Total
detached	882	$73,000	$94,900	70,008
attached	129	63,000	81,900	10,565
mobile	318	30,000	39,000	12,402
apartment	621	26,000	33,800	20,990
Total	1890			121,965

Mess Lake/Bob Quinn Lake

	Number	Base Cost	Isolation	Total
detached	501	$73,000	$94,900	47,545
attached	73	63,000	81,900	5,979
mobile	292	30,000	39,000	11,388
apartment	183	26,000	33,800	6,185
Total	1099			71,097

Kluayetz/Tsetia

	Number	Base Cost	Isloation	Total
detached	462	$73,000	$94,900	43,844
attached	73	63,000	81,900	5,979
mobile	179	26,000	33,800	6,050
apartment	357	30,000	39,000	13,923
Total	1071	202,000	247,000	69,796

Off-site costs for the other physical services were determined solely on the basis of a per capita cost since they have no fixed costs. This applies to all the other physical services except telephone, which is assumed to have no off-site costs.

Table C-7: Off-Site Costs/Capita

	1981[1]	1982[2]
Turnagain	$ 8,322	$ 9,237
Kinaskan	10,938	12,141
Mess Creek/Bob Quinn	8,403	9,327
Kluayetz/Tsetia	9,451	10,490

1. Based on information contained in Sussex Consultants Ltd., Municipal Finance Implications of Community Size.

2. Escalated 11% from June 1981 to June 1982 based on Statistics Canada Consumer Price Index, Vancouver.

C.3.2.2 On-Site Costs

On-site costs are calculated by multiplying the number of residential hectares estimated for each town by the average costs per hectare. The number of residential hectares estimated for each town is calculated using the following densities:

- detached: 8 dwelling units per hectare;
- duplex/attached: 15 dwelling units per hectare;
- townhouse: 30 dwelling units per hectare;
- apartment/hostel: 50 dwelling units per hectare; and
- mobile Home: 18 dwelling units per hectare.

Table C-8: On-Site Servicing Costs

Turnagain

	units	density units/hectare	area	cost/ hectare	cost
detached	428	8	53		
attached	52	15	3		
mobile	136	18	8		
apartment	215	50	4		
Total	831		68	$167,900	= 11,417,200

Kinaskan

	units	density units/hectare	area	cost/ hectare	cost
detached	822	8	103		
attached	129	15	9		
mobile	318	18	18		
apartment	621	50	12		
Total	1890		142	$167,900	= 23,841,000

Mess Lake/Bob Quinn Lake

	units	density units/hectare	area	cost/ hectare	cost
detached	501	8	63		
attached	73	15	5		
mobile	292	18	16		
apartment	183	50	4		
Total	1099		88	$167,900	= 14,775,000

Kluayetz/Tsetia

	units	density units/hectare	area	cost/ hectare	cost
detached	462	8	58		
attached	73	15	4		
mobile	357	18	20		
apartment	179	50	3		
Total	1071		65	$167,900	= 22,163,000

These on-site figures are based on the following costs per hectare. They are derived from Tumbler Ridge estimates and express the total on-site costs (both residential and non-residential) in terms of cost per residential hectares:

water	$32,200 per ha
sewer	21,900 per ha
storm	9,300 per ha
roads	67,800 per ha
lighting	3,200 per ha
power	24,800 per ha
telephone	8,700 per ha
Total	$167,900 per ha

Table C-8 summarizes the on-site costs for the four proposed new towns.

C.3.2.3 Camp, Commercial and Industrial Servicing Costs

The costs of servicing these land uses (abbreviated here as CCI) are estimated by applying their per-capita costs as used for Tumbler Ridge to each town's final population. This total cost for each town is then distributed across the years in much the same manner as in Tumbler Ridge.

It must be noted that while CCI costs have been calculated separately in order to determine capital costs of physical servicing, they have been included as part of the on-site costs in determining the incidence of capital costs.

Table C-9 Commercial Camp and Industrial Costs

	1981[1]	1982[2]
Turnagain	$1,065	$1,183
Kinaskan	1,509	1,675
Mess Creek/Bob Quinn	1,159	1,287
Kluayetz/Tsetia	1,210	1,343

1. Source: Sussex Consultants: Municipal Finance Implications of Community Size.
2. Escalated 11% from June 1981 to June 1982 based on Statistics Canada Consumer Price Index, Vancouver.

C.3.3 Planning and Development Costs

Planning and development costs are based on studies for the Tumbler Ridge project. The costs work to be $945.00 per capita. These are as follows:

Kinaskan	$3,462,000
Bob Quinn/Mess Lake	$2,659,000
Kluayetz/Tsetia	$2,775,000
Turnagain	$2,444,000

C.3.4 Summary of Housing and Physical Services Cost

Table C-10, C-11, C-12 and C-13 summarize the housing and physical services costs for the four proposed new towns: Kinaskan, Mess Lake/Bob Quinn Lake/Telegraph Creek, Kluayetz/Tsetia and Turnagain.

Table C-10: Kinasakan Town: Housing & Physical Services Costs ($000)

	total cost
housing	
. detached	$78,008
. attached	10,565
. mobile	12,402
. apartment	20,990
total	121,965
physical services	
. on-site costs	23,841
. off-site costs	12,141
. commercial/camp/industrial	1,675
planning and development	3,462
TOTAL	$285,049

Table C-11: Bob Quinn Lake/Mess Lake: Housing & Physical Services Costs ($000)

	total cost
housing	
. detached	$47,545
. attached	5,979
. mobile	11,388
. apartment	6,185
total	71,097
physical services	
. on-site costs	14,775
. off-site costs	9,327
. commercial/camp/industrial	1,287
planning and development	2,659
TOTAL	$170,242

Table C-12: Kluayetz/Tsetia: Housing & Physical Services Costs ($000)

	total cost
housing	
. detached	$43,844
. attached	5,979
. mobile	13,923
. apartment	6,050
total	69,796
physical services	
. on-site costs	22,163
. off-site costs	10,490
. commercial/camp/industrial	1,343
planning and development	2,775
TOTAL	$176,403

Table C-13: Turnagain Town: Housing & Physical Services Costs ($000)

	total cost
housing	
. detached	$40,617
. attached	4,259
. mobile	5,304
. apartment	7,267
total	57,447
physical services	
. on-site costs	11,417
. off-site costs	9,237
. commercial/camp/industrial	1,183
planning and development	2,444
TOTAL	$139,175

POOR

QUALITY

ORIGINAL